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Food Safety
and Inspection
Service

To: Donald L. Houston
Administrator

APR 20 1987

From: Ronald E. Engel, Deputy Administrator
for Science

Ronald E. Engel

Subject: Report on Sodium Monitoring Survey, Cycles 1-18

Enclosed please find the Summary Report for the Sodium Monitoring Survey covering all samples collected between May 1982 and September 1985. With your approval, we would like to distribute this report widely.

Sample collection and chemical analysis of products from sampling cycles 19-24 are now complete. We anticipate completion of the data analysis and preparation of the final report by the end of June. At that time we can start designing a new, less intensive program to track changes in the sodium and potassium content of meat and poultry products.

Enclosure

Sodium Monitoring Survey
Summary Report on Sampling Cycles 1 - 18
May 1982 to September 1985

Science Program
Food Safety and Inspection Service
U.S. Department of Agriculture

September, 1986

Sodium Monitoring Survey
Summary Report on Sampling Cycles 1 - 18
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Approved: _____
Ronald E. Engel, Deputy Administrator
for Science

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Executive Summary

The Sodium Monitoring Survey Summary Report on Sampling Cycles 1 - 18 provides descriptive information on the sodium, potassium, and salt (as chloride) contents of nine classes of processed meat and poultry products: smoked, cooked or canned ham, canned luncheon meat, pumped bacon, meat or poultry bologna, pizza with meat, spaghetti products with meat or poultry, fresh pork sausage, canned soups with meat or poultry, and meat or poultry pies. The sodium, potassium, and salt contents of approximately 9,700 samples from these product classes were measured during the sampling period of May 1982 to September 1985.

None of the product classes showed prominent trends over time with respect to sodium, potassium, or salt contents. This result does not preclude the possibility that some changes in the sodium, potassium, or salt contents of individual products did occur.

Of the nine product classes, canned luncheon meat has the highest median sodium content followed closely by ham and then bologna. These three product classes have median sodium contents of over 1000 mg/100gm, or 1%. The lowest median sodium content was found in canned soups. Spaghetti products and pies have similar median sodium contents which are somewhat higher than canned soups. These three product classes have median sodium contents of less than 500 mg/100gm, or 0.5%. The remaining three product classes, bacon, pizza with meat, and fresh pork sausage, have similar median sodium contents which are between 600 mg/100gm and 700 mg/100gm, or 0.6% and 0.7%.

The median sodium values provide only part of the descriptive information from this survey. Variability observed within a product class could, for example, indicate how the sodium content of an individual product may differ from the median or mean sodium content of the respective product class. The ranges of sodium values for several of the different product classes have considerable overlap.

Generally, the data patterns between the product classes for salt content were similar to those observed for sodium content. The data patterns between the product classes for potassium content are somewhat, although not greatly, different than those observed for sodium and salt.

Chloride analyses representing salt content were performed in addition to sodium analyses during the first 15 sampling cycles to determine if there was a useful relationship between these two measurements. If a useful relationship existed between individual sodium and salt values, it might be possible to estimate the sodium content of meat or poultry products analyzed in the past when only their salt content was determined. The

data indicate that a linear relationship exists between sodium and salt. While this relationship might be considered useful for predicting the mean sodium content for a particular salt content in a product class, there is too much variability to satisfacto - ily predict the sodium content for individual units of products.

Sodium Monitoring Survey
Summary Report on Sampling Cycles 1 - 18
May 1982 to September 1985

I. Background

There is public interest in the amount of sodium in foods due to evidence linking sodium intake with hypertension (Hayes and Schweiker, 1982). As one component of a larger effort to encourage voluntary reductions in the sodium content in meat and poultry products, the Food Safety and Inspection Service (FSIS) undertook a program in 1982 to monitor the sodium content in the meat and poultry products under its jurisdiction.

The Food and Nutrition Board (1980) has indicated that there is some evidence that marked alterations in the sodium to potassium ratio, as well as excessive sodium intake, may possibly affect people who are subject to hypertension. Consequently, the potassium content of these products was monitored.

The salt content of meat and poultry products was also monitored. Based on a review of formulations of processed meat and poultry products, salt is the largest single source of sodium added to these products, except in the case of low sodium products.

Since salt content has been routinely analyzed in meat and poultry products over a long period of time, a much greater volume of data exists for salt content than for sodium content. If a useful relationship exists between individual sodium and salt values in these products, it might be possible to compare current sodium values with those values which were reported in the past, even if the products were not analyzed for sodium.

II. Objectives

The objectives of the monitoring program were: 1) to determine the range of sodium, potassium, and salt contents in selected meat and poultry products; 2) to determine if any trends existed over time in the sodium, potassium, and salt contents in these products; and 3) to determine if there was a useful relationship for predicting the sodium content of a particular product from its salt content.

III. Program Design

In order to establish trend data on the sodium, potassium, and salt contents of meat and poultry products, it was necessary to sample and analyze representative products at regular intervals. To keep the monitoring program within the confines of Agency resources, while obtaining data on those products with greatest

impact on the sodium intakes of the public, product selection criteria were developed. The selection criteria were: 1) volume of annual production (used to identify products of highest consumption); 2) amount of salt added (as an important indicator of products contributing the most sodium to diets and therefore more likely to be possible candidates for reduction of added sodium); and 3) purpose of added salt -- for preservation, functional properties, and/or flavor (recognizing that salt added for flavor can be more easily reduced than can salt added for preservation or functional properties).

Using these three criteria, a list of over 1,100 product classes of salt-containing meat and poultry products was narrowed to 9 product classes: smoked, cooked or canned ham, canned luncheon meat, pumped bacon, meat or poultry bologna, pizza with meat, spaghetti products with meat or poultry, fresh pork sausage, canned soups with meat or poultry, and meat or poultry pies. The selection criteria for these 9 product classes are listed in Table 1. A further description of these products is given in Table 2, which includes the MP Form 404 codes, where applicable. Since these 9 product classes were chosen using judgment selection, as compared to a probabilistic sample of product classes from the total number of salt-containing product classes, the descriptive information in this report applies only to the 9 selected product classes.

Information on the volume of annual production of red meat products was obtained from FSIS production data for fiscal year 1981 which was generated from FSIS MP Form 404 information (See Appendix A) (FSIS, 1982). For poultry products, production data were obtained from the A. C. Nielsen Early Intelligence System Directory Data (Nielsen, 1981). Amounts of added salt were estimated from product formulations on file in the Standards and Labeling Division, Meat and Poultry Inspection Technical Services, FSIS.

These initial production volumes were used to create an establishment sampling frame. The sampling frame for red meat products was updated near the end of 1984. The updated production volume information was based on MP Form 404 data for fiscal year 1983.

Samples were scheduled for collection within a product class as follows: 1) The total number of samples to be collected in the product class was divided among the MP Form 404 codes for red meat products or Nielsen codes for poultry products within that product class, based on the proportion of the code's cumulative production to the total cumulative production for the product class. 2) The number of samples collected from each establishment within a code was based on the establishment's production using sampling with replacement and selection probability proportional to establishment production volume. A restriction

was made in this sampling scheme to limit the maximum number of samples collected from any individual establishment to 10 samples. Although this ensures that the samples will not be taken from only a few high production establishments which dominate a particular product class or MP 404 code within a product class, it can introduce a sampling bias. If more than one sample was requested at the establishment, the inspector was instructed to randomly select as many different formulations as possible for products reported under that specific MP 404 code. This procedure may require sampling some formulations more than once or not sampling some formulations at all. Since the sample collection within an establishment was not fully controlled, for reasons of practicality, it is possible that additional sampling biases may occur. The effects of restricting the number of samples collected from any establishment and how the inspectors selected samples within establishments are further discussed in Section VI - Presentation of the Data.

There are several other aspects of the meat and poultry sampling frames that warrant discussion. The sampling frames were not frequently updated because of the lack of availability of resources. This situation can result in requesting samples from establishments that are no longer producing the desired product or from establishments that have closed. In these situations, when the sample request form was returned and it indicated establishment closure or that the establishment no longer made that particular product, the establishment was deleted from the sampling frame for that product. Another problem that can be caused by infrequent sampling frame updates is that either new establishments or establishments which begin producing new product types may not be sampled. In addition, the sampling frame for poultry products is difficult to maintain because of the general lack of available poultry production data for the different product classes.

The product classes were sampled in nine-week cycles, with one of the nine product classes being sampled each week on a rotating basis. The first sampling cycle began in May 1982, and sampling for the 18th cycle was completed by September 1985. The number of samples collected for each product class varies, and was related to the variability found in their sodium values. The sample sizes initially used were adjusted after the fourth sampling cycle in response to preliminary variability estimates obtained during the first three sampling cycles.

The samples were collected by USDA/FSIS inspectors from the selected meat and poultry establishments and forwarded to the FSIS Field Service Laboratory in Athens, Georgia, where they were analyzed for sodium, potassium, and salt content. The analytical results were entered into the FSIS computerized Laboratory Sample Flow System and transmitted to Science program headquarters in Washington, DC, for compilation, storage, and data analysis.

Hard copies of analytical results were also forwarded to headquarters.

The samples were analyzed for sodium and potassium ion content by direct chemical methods, while salt content was measured by the presence of the chloride ion. During the first few sampling cycles of this survey, sodium and potassium were determined by flame emission spectrometry, and salt was determined by the Volhard method for chloride (AOAC, 1980). During this time, an automated method for simultaneous determination of all three ions using ion specific electrodes (ISE) (FSIS, 1983) was refined and validated. Because of its greater speed and lower cost per analysis, the ISE method was adopted as the analytical system for this survey, and the majority of the analyses have been made with this method.

IV. Monitoring Program Database

Approximately 9,700 samples (out of 13,900 samples scheduled for collection) were obtained from the 9 product classes and analyzed for sodium and potassium content in the 18 sampling cycles. The number of data records is listed by product class in each sampling cycle in Table 3. The percentage of samples analyzed out of the total number of samples requested by product class and sampling cycle is given in Table 4. This information provides a rough estimate of the non-response rate due to such causes as an establishment on strike, an establishment not producing, an establishment closed, uncooperative management, and sample spoilage. The number of establishments from which one or more samples were collected is given in Table 5 by product class and sampling cycle.

In Table 4 it is noted that the percentage of samples analyzed out of the total requested for the soups and pies product classes was lower than the other product classes. A large portion of the soups and pies product classes were poultry products. The lack of poultry production data made it more difficult to find poultry establishments making these products within the sampling frame. Many plants that were sampled did not produce these products, therefore the response rate to our request was low. Hence, a lower percentage of samples was analyzed.

All analytical results are reported in mg/100gm. Since canned soups can be ready-to-serve, semi-condensed, or condensed, all semi-condensed and condensed soup sample results were adjusted by the appropriate dilution factor to convert the data to a ready-to-serve basis.

Samples were not analyzed for salt after the 15th sampling cycle and not all samples were analyzed for salt in the 15th cycle. Also, analytical problems were experienced with the salt analyses during the third sampling cycle, and approximately 400 salt

analyses in this cycle were deleted. The sodium and potassium values were not affected since they were obtained by different analytical procedures.

V. Laboratory and Data Quality Control

Laboratory Quality Assurance Program: The quality assurance program for the automated ISE method has five phases:

1. A continuous check is made by the instrument of its internal operating conditions. If any problem is detected, sample analyses are halted until the problem is corrected. Another step in this first phase consists of a two point calibration process for each electrode using known concentrations of analyte ions. This is automatically performed every two hours.

2. Four known concentrations of each analyte ion that span the region of interest are analyzed. A best straight line calibration curve is calculated for each analyte ion. Analyses on actual samples are not started until the three calibration curves are acceptable.

3. An internal check sample is analyzed with each set of product samples. This sample is analyzed a number of times by flame emission spectrometry for sodium and potassium, and by Volhard titration for chloride to establish target values for each analyte ion. Analytical results for this check sample obtained by the automated ISE method must match the established target values within two standard deviations before analyses may begin.

4. Recovery values for each of the analyte ions are determined for samples having a matrix of interest and for spiked samples of this same matrix.

5. If the results for a particular sample from a product class greatly differ from a representative mean (and standard deviation) value for the product class, the sample is rerun for verification.

Data Screening Procedures: Checks were performed to determine the validity of the recorded data. These included manual checking of the hard copy of the laboratory results and other information such as product labels and formulation data, and the use of computer programs that identified certain types of data inconsistencies. The data screening procedures used for this report were more thorough than had been previously used in the summary report on the first six sampling cycles (FSIS, 1984). There were some data records that were used in this previous report that were corrected or deleted, however these corrections caused only minor changes in the summary statistics given in that report.

The recorded product name and brand name were used, when available, to determine if an inappropriate product had been collected. Data from all such products were deleted.

Computer programs provided a consistent screening of the data to identify very high or low values, and data inconsistencies such as duplicate sample entries, invalid MP 404 codes, etc. Box-and-whisker plots (explained in detail in the following section) were used to provide a consistent and objective way to identify very high or low values. When inconsistencies were noted, the hard copy of the laboratory results and other available information were used to resolve the inconsistencies. In several cases where the validity of the data remained in question, further investigations were made, which often required reviewing product label and formulation information. In a few instances where the identified inconsistencies could not be resolved, the data from these samples were deleted.

When data for a product class changed noticeably between different sampling cycles, the types of products and the establishments sampled were reviewed to obtain information needed to explain such changes.

VI. Presentation of the Data

The data are presented in summary statistics tables and box-and-whisker plots. The tables provide the number of sample results, median and mean values, standard deviations, coefficients of variation, lower and upper quartiles, and the minimum and maximum values of sodium, potassium, and salt contents by product class and sampling cycle. The coefficient of variation expressed as a percent (standard deviation / mean) x 100, provides a measure of relative variability.

The summary statistics given in these tables were computed by using all data values for a product class or cycle within a product class and by using equal weighting of each data value.

Ideally, individual data values could be weighted to take into account the following factors: 1) the limitation of not collecting more than 10 samples from any establishment within a sampling cycle; 2) the selection of particular products within an establishment, which may not have been randomly selected with probability proportional to production volume of relevant products within the establishment; and, 3) the lack of adjustments for nonresponse. Limitations on the resources available for this survey resulted in the inability to account for these factors. For the first and third factors listed above, adjustments of the summary statistics by appropriate weights (functions of production volumes or nonresponse rate) would be necessary for the summary statistics to better represent the product class sample statistics. For the second factor, accurate production

volumes on a product-by-product basis could be difficult, if not impracticable to obtain. Although the effect of not using weights is unknown, it is not expected that the overall conclusions from this survey would be appreciably altered by their use.

These data are also presented in graphical form by means of box-and-whisker plots (referred to as "boxplots"). The boxplots provide a quick, visual summary of how the data are distributed. That is, they indicate where the main bulk of data values lie, how symmetrically the values are distributed about the median value, the variability of the data, and the extreme values. These plots can be used for making visual comparisons between the different product classes and for observing prominent trends within a product class. The construction and interpretation of boxplots are discussed in Appendix B.

The relationship between sodium and salt results was examined by using scatterplots of the sodium values versus the salt values and by using regression analysis in a noninferential manner.

In the last summary report on this survey (FSIS, 1984), data from the first 6 sampling cycles were used to establish a baseline. However, at the present time it is believed that the data from each sampling cycle of a product class are more meaningfully treated as a separate entity, so as not to lose trend information by combining the results of any group of cycles. If, for example, some event was known to have occurred at a specific time (such as the hypothetical issuing of a regulation on sodium content), then establishment of a baseline comparison period could be used for before-event to after-event comparisons; but without such a temporal event, the baseline concept is not necessary to detect trends.

VII. Discussion of Sodium Results

Table 6 gives the summary statistics, combining the data from all 18 sampling cycles, for the sodium results for each product class. Table 7 presents the summary statistics for the sodium analyses by individual cycle for each product class. Figure 1 presents the boxplots of the sodium results by product class for the combined data. Figures 2 - 10 present boxplots of the sodium results for each product class by individual sampling cycle.

None of the product classes showed any prominent trends over time with regard to sodium content. The absence of any prominent trends, and the presence of similar data distributions across the 18 sampling cycles, suggest that data within a product class from these cycles may be combined for summary purposes. The summary statistics computed from the combined data provide reasonable estimates of sodium levels for the product classes during the sampling period.

Of the nine product classes, canned luncheon meat has the highest median (and mean) sodium content followed closely by ham and then bologna. These three product classes have median (and mean) sodium contents of over 1000 mg/100gm, or 1%. The lowest median (and mean) sodium content was found in soup products. Spaghetti products and pies have similar median (and mean) sodium contents which are somewhat higher than soup products. These three product classes have median (and mean) sodium contents of less than 500 mg/100gm, or 0.5%. The remaining three product classes, bacon, pizza, and sausage, have similar median (and mean) sodium contents which are between 600 mg/100gm and 700 mg/100gm, or 0.6% and 0.7%.

While both ham and canned luncheon meat have high median sodium contents, they have different degrees of sodium variability. The ham product class shows a high variation in sodium while canned luncheon meat is among the product classes with lower variability.

Generally, the samples having noticeably lower or higher sodium content are a reflection of products formulated with reduced sodium or salt, which may or may not be replaced with potassium chloride, or products whose formulations contain multiple ingredients high in sodium (such as dough or broth). In the case of the luncheon meat product class, most of the samples collected were from three establishments. The two main product types from these establishments were not collected in equal quantities in each cycle. Sampling predominantly one type of product over the other resulted in inconsistent variability for this product class.

VIII. Discussion of Potassium Results

Table 8 gives the summary statistics, combining the data from all 18 sampling cycles, for the potassium results for each product class. Table 9 presents the summary statistics for the potassium analyses by individual cycle for each product class. Figure 11 presents the boxplots of the potassium results by product class for the combined data. Figures 12 - 20 present boxplots of the potassium results for each product class by individual sampling cycle.

None of the product classes showed any prominent trends, over time, with regard to potassium content. As observed for sodium content, the absence of prominent trends and the presence of similar data distributions across the 18 sampling cycles suggest that the data within a product class from these cycles may be combined for summary purposes.

The relationship between product classes for potassium contents is somewhat, although not greatly, different than was observed for sodium (and salt). Ham has the highest median (and mean)

potassium content, approximately 275 mg/100gm or 0.275%. Soup has the lowest median (and mean) potassium content, approximately 50 mg/100gm or 0.05%. The other product classes had median (and mean) potassium contents approximately between 100 mg/100gm and 200 mg/100gm, or 0.1% and 0.2%. Hams, pies, and soup are the most variable product classes. Generally, the samples having noticeably higher potassium content are a reflection of products formulated with reduced sodium or salt which was replaced with potassium chloride, or products which contained ingredients high in potassium (such as legumes).

IX. Discussion of Salt Results

Table 10 gives the summary statistics, combining the data from the 15 sampling cycles in which salt was measured, for the salt results for each product class. Table 11 presents the summary statistics for the salt analyses by individual cycle for each product class. Figure 21 presents the boxplots of the salt results by product class for the combined data. Figures 22 - 30 present boxplots of the salt results for each product class by individual sampling cycle.

None of the product classes showed any prominent trends, over time, with regard to salt content. As observed for sodium and potassium content, the absence of prominent trends and the presence of similar data distributions across the 15 sampling cycles suggest that the data within a product class from these cycles may be combined for summary purposes.

The relationship between product classes for salt results is similar to that obtained for sodium. Canned luncheon meat had the highest median (and mean) salt content, over 3000 mg/100gm or 3%, followed by ham and bologna, with the latter two product classes having a median (and mean) salt content over 2500 mg/100gm, or 2.5%. Soup had the lowest median (and mean) salt content, which was approximately 900 mg/100gm or 0.9%. The next lowest product classes were pies and spaghetti products which had similar median (and mean) salt contents of approximately 1100 mg/100gm or 1.1%. The median (and mean) salt contents for the bacon, pizza and sausage product classes were between 1400 mg/100gm and 1600 mg/100gm, or 1.4% and 1.6%.

Generally, the samples having noticeably lower or higher salt content are a reflection of products formulated with reduced sodium or salt, or products formulated with high sodium-containing ingredients (such as broth, soup base, dough, and gravy).

X. Relationship Between Sodium and Salt

In order to investigate a possible relationship between sodium and salt for the different product classes, scatterplots of the sodium values versus the salt values were made and are presented

in Figures 31 - 39. Each figure represents a product class and shows data from all 15 sampling cycles where both sodium and salt content were determined. Boxplots of the sodium to salt ratio, expressed as a percent, are presented in Figure 40.

These plots indicate that a linear relationship exists between sodium and salt contents. However, the nature of this relationship varies for the different product classes. Furthermore, there can be considerable variability in the sodium values corresponding to a given salt value. This variability affects the usefulness of this linear relationship in predicting the sodium content of a particular unit of product from its salt content.

The relationships between sodium and salt contents were investigated further by using regression analysis in a noninferential manner. The results are summarized in Table 12. The regression results and the information displayed in the scatterplots support the following conclusions on the usefulness of the sodium to salt relationship.

While the relationship might be considered useful for predicting the mean sodium content for a particular salt content within a product class, there is generally too much variability to satisfactorily predict the sodium content for individual units of products. Additionally, since it would be difficult to identify and sample historical data in a manner comparable with this survey, the usefulness of this relationship is further diminished.

XI. References

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Table 1. Product Classes Sampled

Product Class	Production Range millions of lbs or units 2/	Added Salt Amount %	Added Salt Principal Purpose 1/
Smoked, Cooked or Canned Ham 3/	¨100	¨2.0	P
Canned Luncheon Meat 3/	10-100	¨2.0	P
Pumped Bacon 3/	¨100	1.2-2.0	P
Bologna 4/	¨100	¨2.0	FP
Pizza 3/	¨100	1.2-2.0	F
Spaghetti Products 4/	¨100	1.2-2.0	F
Fresh Pork Sausage 3/	¨100	1.2-2.0	F
Canned Soup 4/	¨100	ˆ1.2	F
Pies 4/	¨100	ˆ1.2	F

1/ Principal Purpose: P = Preservation, FP = Functional Properties, F = Flavor.

2/ "Units" is the measure used in the A. C. Nielsen Data Base. It is not always equivalent to pounds.

3/ Only meat products.

4/ Both meat and poultry products.

Table 2. Product Class Numbers and Descriptions

Product Class Number	Product Description	MP Form 404 Codes 1/
1	Smoked or Cooked Ham	1121 - 1128
	Canned Ham	2622, 2623
2	Canned Luncheon Meat	2612
3	Pumped Bacon	1440
4	Meat Bologna	1340 - 1343
	Poultry Bologna	N/A 2/
5	Pizza with Meat	1610
6	Spaghetti Products with Meat	2742
	Spaghetti Products with Poultry	N/A 2/
7	Fresh Pork Sausage	1311
8	Canned Soup with Meat	2790
	Canned Soup with Poultry	N/A 2/
9	Meat Pies (Turnovers, Tamales, Burritos, etc.)	1615
	Poultry Pies (Turnovers, Tamales, Burritos, etc.)	N/A 2/

1/ A copy of the MP Form 404 is given in Appendix A.

2/ N/A - Not Applicable. MP Form 404 provides no data on poultry products.

Table 3. Number of Data Records by Product Class and Sampling Cycle 1/

	Product Class									
Cycle	1	2	3	4	5	6	7	8	9	Cycle Total
1	81	47	78	73	61	33	70	83	43	569
2	67	48	75	83	58	36	75	30	44	516
3	77	55	73	74	57	52	74	40	50	552
4	80	45	75	54	54	53	64	45	44	514
5	132	43	74	64	48	31	76	66	43	577
6	134	30	81	64	41	34	59	48	42	533
7	131	30	75	65	39	29	64	25	31	489
8	129	32	85	72	47	26	63	50	40	544
9	128	27	92	67	44	17	67	48	39	529
10	123	21	83	63	43	24	71	57	34	519
11	128	39	80	73	35	15	67	63	38	538
12	120	30	80	69	41	12	68	58	36	514
13	103	20	67	63	43	21	60	54	27	458
14	111	31	78	72	42	28	73	69	47	551
15	107	37	82	67	55	19	81	60	42	550
16	134	36	74	72	56	24	73	79	34	582
17	127	41	81	70	56	21	77	80	33	586
18	136	38	84	69	50	30	76	62	30	575
Totals	2048	650	1417	1234	870	505	1258	1017	697	9696

Total number of data records = 9696

Product Classes: 1 - smoked, cooked or canned ham
2 - canned luncheon meat
3 - pumped bacon
4 - meat or poultry bologna
5 - pizza with meat
6 - spaghetti products with meat or poultry
7 - fresh pork sausage
8 - canned soup with meat or poultry
9 - meat or poultry pies

1/ These counts apply to both the sodium and potassium values. No salt analyses were made in cycles 16 - 18 and not all samples in cycle 15 were analyzed for salt. Approximately 400 salt analyses were deleted from cycle 3 due to analytical problems. The exact number of data records for salt analyses are given in Tables 10 and 11.

Table 4. Percent of Samples Analyzed Out of the Total Number of Samples Requested. 1/

Cycle	Product Class 1	2	3	4	5	6	7	8	9	Cycle Total
1	90	81	87	78	76	69	78	93	48	78
2	74	84	83	92	68	67	83	33	49	70
3	86	85	81	82	63	81	82	44	51	72
4	90	80	83	60	66	86	71	50	45	69
5	84	64	74	75	80	64	84	54	57	72
6	84	60	81	75	75	57	65	39	56	67
7	82	60	75	82	70	87	71	22	41	64
8	81	68	85	86	80	86	70	40	53	71
9	80	49	92	80	77	54	74	41	52	69
10	77	41	83	75	73	88	78	48	45	67
11	80	68	80	87	66	46	74	50	50	69
12	75	50	80	82	72	46	75	46	48	66
13	64	38	67	75	75	72	67	47	36	60
14	69	60	78	86	73	82	81	59	62	72
15	67	62	82	79	91	54	88	50	56	70
16	84	51	74	83	86	55	81	59	44	71
17	80	68	81	79	86	48	86	64	42	73
18	86	63	85	82	83	88	84	50	40	73
Totals	79	63	81	80	75	69	77	49	49	70

Total number of samples analyzed = 9696
Total number of samples requested = 13,928
Overall percent of samples analyzed/requested = 70%

Product Classes: 1 - smoked, cooked or canned ham
2 - canned luncheon meat
3 - pumped bacon
4 - meat or poultry bologna
5 - pizza with meat
6 - spaghetti products with meat or poultry
7 - fresh pork sausage
8 - canned soup with meat or poultry
9 - meat or poultry pies

1/ The total percentage represents only those samples analyzed and does not include samples requested but not collected for the various reasons outlined in this report.

Table 5. Number of Establishments Sampled by Product Class and Sampling Cycle. 1/

	Product Class								
Cycle	1	2	3	4	5	6	7	8	9
1	53	8	51	47	14	6	46	17	17
2	45	8	42	54	16	7	40	14	21
3	44	7	40	49	17	8	47	22	27
4	52	7	36	33	21	9	45	19	24
5	71	8	38	41	18	8	57	19	22
6	71	5	36	39	14	8	37	14	26
7	69	3	44	40	15	6	48	9	24
8	73	5	48	48	14	7	40	19	27
9	80	3	46	45	11	4	38	21	28
10	71	3	46	43	13	5	49	21	25
11	69	6	38	46	11	6	46	23	29
12	63	3	41	46	12	2	44	18	26
13	63	2	35	47	12	3	40	16	16
14	70	4	41	47	10	8	43	20	29
15	66	6	42	45	16	6	52	19	28
16	85	5	43	45	17	7	48	23	19
17	82	5	40	43	16	7	50	22	21
18	82	5	45	43	13	8	47	19	20
Total 2/	248	16	125	199	61	20	237	55	108

Product Classes: 1 - smoked, cooked or canned ham
2 - canned luncheon meat
3 - pumped bacon
4 - meat or poultry bologna
5 - pizza with meat
6 - spaghetti products with meat or poultry
7 - fresh pork sausage
8 - canned soups with meat or poultry
9 - meat or poultry pies

1/ The number of establishments from which one or more samples were collected.

2/ The total represents the number of establishments from which one or more samples were collected during the 18 sampling cycles. This total is not the sum of establishments sampled in each of the sampling cycles since some establishments were sampled in more than one sampling cycle.

Table 6. Overall Summary Statistics of SODIUM Values in mg/100gm by Product Class.

Product Class	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Ham	2048	1205	1211	230	19	1059	1352	75	2339
Luncheon Meat	650	1353	1329	142	11	1295	1403	791	1654
Bacon	1417	665	672	166	25	565	770	125	1697
Bologna	1234	1047	1048	145	14	950	1139	600	1681
Pizza	870	630	634	94	15	579	688	330	1098
Spaghetti	505	457	459	68	15	424	494	201	741
Sausage	1258	604	622	114	18	551	686	139	1134
Soup	1017	377	374	72	19	351	404	6	742
Pies	697	455	454	120	26	365	522	127	1173

Table 7. Summary Statistics of SODIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Ham	1	81	1262	1266	257	20	1075	1389	797	2004
Ham	2	67	1189	1196	260	22	1045	1381	654	1990
Ham	3	77	1287	1276	219	17	1139	1417	703	1780
Ham	4	80	1183	1200	228	19	1053	1351	769	1895
Ham	5	132	1131	1147	219	19	999	1287	571	1739
Ham	6	134	1223	1210	227	19	1064	1379	552	1861
Ham	7	131	1208	1209	239	20	1065	1334	555	1964
Ham	8	129	1186	1186	212	18	1026	1331	752	1815
Ham	9	128	1169	1197	229	19	1015	1342	811	2076
Ham	10	123	1178	1177	234	20	1016	1347	563	1784
Ham	11	128	1162	1200	254	21	1058	1322	459	2042
Ham	12	120	1210	1226	244	20	1070	1341	617	2339
Ham	13	103	1228	1242	244	20	1101	1385	408	1990
Ham	14	111	1270	1282	195	15	1130	1395	806	1815
Ham	15	107	1284	1292	227	18	1148	1448	796	1895
Ham	16	134	1209	1217	193	16	1099	1350	455	1713
Ham	17	127	1182	1171	193	17	1066	1288	585	1578
Ham	18	136	1187	1178	233	20	1045	1303	75	1810
Luncheon Meat	1	47	1334	1302	116	9	1259	1365	830	1481
Luncheon Meat	2	48	1325	1323	119	9	1257	1371	1080	1643
Luncheon Meat	3	55	1351	1343	122	9	1294	1414	1062	1566
Luncheon Meat	4	45	1392	1378	92	7	1330	1421	1118	1594
Luncheon Meat	5	43	1358	1322	98	7	1296	1387	1055	1451
Luncheon Meat	6	30	1347	1328	83	6	1315	1370	1089	1483
Luncheon Meat	7	30	1364	1310	135	10	1343	1384	994	1406
Luncheon Meat	8	32	1337	1340	72	5	1317	1381	1123	1449
Luncheon Meat	9	27	1372	1360	68	5	1335	1403	1095	1452
Luncheon Meat	10	21	1389	1388	74	5	1340	1428	1207	1546
Luncheon Meat	11	39	1371	1358	90	7	1321	1426	1164	1478
Luncheon Meat	12	30	1413	1420	71	5	1369	1465	1290	1592
Luncheon Meat	13	20	1369	1367	39	3	1337	1404	1298	1437
Luncheon Meat	14	31	1453	1443	128	9	1312	1562	1214	1654
Luncheon Meat	15	37	1341	1276	166	13	1243	1361	913	1615
Luncheon Meat	16	36	1296	1276	111	9	1226	1356	938	1436
Luncheon Meat	17	41	1415	1309	257	20	1314	1484	838	1594
Luncheon Meat	18	38	1273	1160	219	19	874	1338	791	1378

Table 7. (cont'd) Summary Statistics of SODIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Bacon	1	78	671	674	165	24	563	748	302	1249
Bacon	2	75	672	697	163	23	590	783	385	1230
Bacon	3	73	648	666	173	26	561	768	322	1202
Bacon	4	75	682	694	173	25	555	817	357	1324
Bacon	5	74	647	641	135	21	558	708	210	1048
Bacon	6	81	675	673	136	20	563	782	413	1055
Bacon	7	75	657	667	123	18	597	747	290	900
Bacon	8	85	668	677	165	24	574	781	331	1284
Bacon	9	92	626	641	182	28	544	718	265	1697
Bacon	10	83	651	665	168	25	541	772	222	1187
Bacon	11	80	689	681	136	20	609	768	125	1087
Bacon	12	80	655	663	152	23	564	762	334	1147
Bacon	13	67	679	695	161	23	588	831	345	1038
Bacon	14	78	681	665	145	22	547	757	366	1048
Bacon	15	82	701	696	202	29	554	819	320	1245
Bacon	16	74	658	685	182	27	581	749	366	1316
Bacon	17	81	630	672	196	29	532	777	306	1244
Bacon	18	84	654	654	197	30	550	771	156	1115
Bologna	1	73	1038	1034	122	12	962	1101	719	1482
Bologna	2	83	1061	1052	127	12	996	1107	708	1386
Bologna	3	74	1055	1045	157	15	958	1149	718	1471
Bologna	4	54	1092	1103	184	17	1000	1199	610	1681
Bologna	5	64	1035	1027	127	12	968	1085	654	1303
Bologna	6	64	1014	1037	145	14	956	1104	750	1499
Bologna	7	65	1012	1026	138	13	932	1062	763	1496
Bologna	8	72	1045	1051	135	13	945	1156	788	1316
Bologna	9	67	1030	1022	151	15	913	1110	600	1432
Bologna	10	63	1091	1087	135	12	969	1171	815	1434
Bologna	11	73	1046	1040	147	14	925	1145	682	1501
Bologna	12	69	1063	1058	136	13	977	1154	772	1330
Bologna	13	63	1096	1091	159	15	966	1168	759	1667
Bologna	14	72	1068	1076	156	14	962	1176	732	1625
Bologna	15	67	1106	1074	151	14	951	1174	672	1380
Bologna	16	72	1005	1008	135	13	935	1060	662	1530
Bologna	17	70	1027	1043	140	13	941	1149	715	1484
Bologna	18	69	1014	1008	140	14	896	1063	768	1618

Table 7. (cont'd) Summary Statistics of SODIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Pizza	1	61	672	668	74	11	619	725	452	837
Pizza	2	58	646	661	79	12	603	712	492	838
Pizza	3	57	633	644	97	15	585	696	404	888
Pizza	4	54	614	606	85	14	561	659	373	795
Pizza	5	48	620	611	82	13	574	652	355	773
Pizza	6	41	639	620	88	14	582	676	330	818
Pizza	7	39	609	630	105	17	565	699	428	914
Pizza	8	47	640	639	73	11	579	692	519	788
Pizza	9	44	605	627	107	17	576	676	423	1082
Pizza	10	43	612	618	84	14	545	683	408	776
Pizza	11	35	659	664	101	15	594	689	520	971
Pizza	12	41	628	617	78	13	564	654	462	861
Pizza	13	43	668	674	105	16	606	728	486	1017
Pizza	14	42	624	636	105	16	557	684	383	926
Pizza	15	55	625	629	117	19	534	740	362	864
Pizza	16	56	635	625	93	15	588	688	354	836
Pizza	17	56	603	603	91	15	551	665	366	752
Pizza	18	50	631	637	101	16	588	672	377	1098
Spaghetti	1	33	449	450	45	10	418	479	346	548
Spaghetti	2	36	444	457	50	11	433	469	356	617
Spaghetti	3	52	480	486	54	11	443	519	390	671
Spaghetti	4	53	436	429	66	15	416	451	246	572
Spaghetti	5	31	452	434	93	22	386	484	255	690
Spaghetti	6	34	464	467	60	13	423	501	352	611
Spaghetti	7	29	452	445	49	11	433	472	323	522
Spaghetti	8	26	491	474	75	16	464	505	242	618
Spaghetti	9	17	452	446	57	13	396	479	364	557
Spaghetti	10	24	476	470	60	13	456	509	292	548
Spaghetti	11	15	460	475	69	14	424	512	394	667
Spaghetti	12	12	491	489	43	9	455	517	422	575
Spaghetti	13	21	459	464	39	8	445	479	392	585
Spaghetti	14	28	505	515	91	18	464	523	400	741
Spaghetti	15	19	450	463	65	14	427	499	360	591
Spaghetti	16	24	427	433	82	19	376	478	317	709
Spaghetti	17	21	438	438	79	18	389	496	201	560
Spaghetti	18	30	432	445	58	13	413	464	336	631

Table 7. (cont'd) Summary Statistics of SODIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Sausage	1	70	652	656	123	19	560	738	408	1009
Sausage	2	75	611	643	118	18	573	718	314	904
Sausage	3	74	555	577	114	20	513	662	140	879
Sausage	4	64	584	589	118	20	501	662	351	868
Sausage	5	76	570	593	100	17	531	645	388	847
Sausage	6	59	586	609	86	14	552	644	472	929
Sausage	7	64	604	621	111	18	561	653	344	933
Sausage	8	63	591	603	95	16	556	632	388	844
Sausage	9	67	598	612	95	15	536	670	445	843
Sausage	10	71	583	611	114	19	545	666	406	1134
Sausage	11	67	648	663	120	18	607	709	370	1108
Sausage	12	68	636	661	105	16	582	726	484	1027
Sausage	13	60	655	651	112	17	575	725	366	925
Sausage	14	73	597	619	112	18	560	659	384	1065
Sausage	15	81	616	639	119	19	574	702	425	1058
Sausage	16	73	602	624	111	18	557	656	405	1053
Sausage	17	77	609	638	113	18	565	717	400	963
Sausage	18	76	577	593	128	22	529	656	139	1051
Soup	1	83	386	383	53	14	368	415	20	476
Soup	2	30	390	389	43	11	370	420	307	462
Soup	3	40	374	384	86	22	347	415	177	644
Soup	4	45	362	351	97	28	337	395	30	516
Soup	5	66	376	377	41	11	349	391	305	536
Soup	6	48	379	362	130	36	353	421	15	710
Soup	7	25	393	389	38	10	358	412	320	448
Soup	8	50	371	391	68	17	353	404	305	711
Soup	9	48	361	353	74	21	327	396	28	466
Soup	10	57	381	379	39	10	366	398	285	512
Soup	11	63	373	371	67	18	351	402	15	462
Soup	12	58	386	372	92	25	360	419	6	480
Soup	13	54	390	385	73	19	370	416	29	534
Soup	14	69	387	392	65	16	366	429	27	538
Soup	15	60	377	389	84	22	361	413	25	742
Soup	16	79	357	353	71	20	336	385	24	457
Soup	17	80	371	366	55	15	346	391	46	543
Soup	18	62	361	364	59	16	346	387	113	540

Table 7. (cont'd) Summary Statistics of SODIUM Values in mg/100gm by Product Class and Sampling Cycle..

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Pies	1	43	460	457	99	22	387	528	286	721
Pies	2	44	492	478	119	25	385	527	260	877
Pies	3	50	456	445	90	20	370	509	186	621
Pies	4	44	411	435	91	21	361	506	208	628
Pies	5	43	462	452	101	22	350	538	277	684
Pies	6	42	442	467	156	33	368	549	239	1173
Pies	7	31	466	468	131	28	365	538	223	854
Pies	8	40	455	480	107	22	412	520	300	801
Pies	9	39	463	470	142	30	377	524	236	913
Pies	10	34	500	475	107	23	401	540	209	704
Pies	11	38	448	454	195	43	319	573	127	1048
Pies	12	36	477	461	119	26	396	515	249	762
Pies	13	27	433	441	157	36	322	505	250	1019
Pies	14	47	417	426	112	26	338	514	226	724
Pies	15	42	465	444	83	19	375	514	229	561
Pies	16	34	408	418	102	24	337	501	268	713
Pies	17	33	429	438	94	22	365	513	293	721
Pies	18	30	470	479	124	26	358	567	252	704

Table 8. Overall Summary Statistics of POTASSIUM Values in mg/100gm by Product Class.

Product Class	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Ham	2048	274	281	72	26	249	300	149	1266
Luncheon Meat	650	220	214	26	12	200	229	130	314
Bacon	1417	126	131	37	28	105	153	33	299
Bologna	1234	182	187	32	17	171	196	54	896
Pizza	870	192	201	43	22	167	231	107	351
Spaghetti	505	143	146	27	19	129	159	29	338
Sausage	1258	203	204	35	17	183	224	43	462
Soup	1017	44	67	57	85	23	102	6	528
Pies	697	114	132	60	45	85	170	42	382

Table 9. Summary Statistics of POTASSIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Ham	1	81	266	265	40	15	237	289	184	352
Ham	2	67	265	266	30	11	242	286	182	340
Ham	3	77	278	275	41	15	244	307	191	376
Ham	4	80	260	264	54	20	235	287	150	610
Ham	5	132	275	275	42	15	248	300	178	525
Ham	6	134	272	268	41	15	239	295	174	360
Ham	7	131	267	267	36	14	245	285	176	371
Ham	8	129	270	275	68	25	246	289	194	793
Ham	9	128	273	277	67	24	248	298	193	918
Ham	10	123	280	291	95	33	255	302	188	865
Ham	11	128	274	293	111	38	255	299	190	953
Ham	12	120	280	295	97	33	254	306	181	854
Ham	13	103	273	278	44	16	256	296	149	438
Ham	14	111	323	333	80	24	301	348	242	877
Ham	15	107	284	296	93	31	261	311	184	978
Ham	16	134	272	280	97	34	244	299	152	1266
Ham	17	127	278	284	69	24	256	300	185	836
Ham	18	136	260	264	41	15	246	285	168	534
Luncheon Meat	1	47	217	216	21	10	200	229	176	254
Luncheon Meat	2	48	221	210	28	13	183	230	148	253
Luncheon Meat	3	55	209	208	17	8	194	221	181	253
Luncheon Meat	4	45	221	215	27	12	213	227	151	266
Luncheon Meat	5	43	230	227	15	6	215	239	194	246
Luncheon Meat	6	30	225	217	19	9	201	230	178	239
Luncheon Meat	7	30	202	194	34	18	178	224	130	230
Luncheon Meat	8	32	223	212	22	10	188	227	165	241
Luncheon Meat	9	27	228	215	26	12	191	235	168	248
Luncheon Meat	10	21	227	224	18	8	219	233	158	251
Luncheon Meat	11	39	221	211	28	13	179	232	161	251
Luncheon Meat	12	30	231	221	36	16	180	243	160	301
Luncheon Meat	13	20	233	237	20	8	222	250	210	289
Luncheon Meat	14	31	240	231	36	16	191	253	182	314
Luncheon Meat	15	37	209	203	21	10	196	216	147	231
Luncheon Meat	16	36	216	211	19	9	205	224	165	237
Luncheon Meat	17	41	218	206	22	11	180	222	159	230
Luncheon Meat	18	38	210	206	18	9	202	216	145	237

Table 9. (cont'd) Summary Statistics of POTASSIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Bacon	1	7B	134	137	35	26	108	156	74	243
Bacon	2	75	123	124	33	26	100	145	61	222
Bacon	3	73	123	131	34	26	105	153	74	210
Bacon	4	75	107	114	33	29	93	129	43	214
Bacon	5	74	125	125	35	2B	97	145	64	229
Bacon	6	81	119	122	33	27	103	143	65	212
Bacon	7	75	11B	123	32	26	104	146	58	205
Bacon	B	B5	110	115	35	31	91	132	54	259
Bacon	9	92	126	12B	32	25	103	146	61	237
Bacon	10	B3	140	13B	30	22	119	159	61	207
Bacon	11	B0	131	137	41	30	111	160	57	299
Bacon	12	B0	141	14B	36	25	124	171	55	274
Bacon	13	67	131	135	41	30	106	151	61	257
Bacon	14	78	141	140	37	26	110	167	65	236
Bacon	15	B2	124	133	45	34	103	162	36	249
Bacon	16	74	122	130	37	29	106	151	61	22B
Bacon	17	B1	131	141	39	2B	110	172	5B	222
Bacon	1B	B4	131	129	40	31	101	157	33	217
Bologna	1	73	177	182	24	13	167	192	141	303
Bologna	2	83	175	179	19	10	169	1B4	152	26B
Bologna	3	74	179	1B3	19	11	171	194	140	243
Bologna	4	54	175	175	17	10	166	1B3	133	224
Bologna	5	64	177	1B1	19	11	16B	190	152	241
Bologna	6	64	177	179	16	9	170	1B6	143	237
Bologna	7	65	17B	180	21	11	170	186	137	245
Bologna	B	72	1B1	1B2	1B	10	171	1BB	110	227
Bologna	9	67	188	190	44	23	172	196	54	456
Bologna	10	63	191	193	17	9	181	202	163	261
Bologna	11	73	185	191	25	13	174	201	148	271
Bologna	12	69	198	202	20	10	190	209	162	267
Bologna	13	63	1B4	204	95	47	174	209	127	B96
Bologna	14	72	195	200	1B	9	186	211	169	257
Bologna	15	67	1B7	191	26	14	174	203	149	325
Bologna	16	72	1B3	186	23	13	169	196	120	291
Bologna	17	70	177	1B4	22	12	169	199	129	241
Bologna	1B	69	175	181	26	14	163	193	141	293

Table 9. (cont'd) Summary Statistics of POTASSIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Pizza	1	61	187	194	30	16	169	218	155	257
Pizza	2	58	198	209	39	19	178	231	154	295
Pizza	3	57	224	228	49	21	193	259	145	341
Pizza	4	54	186	204	50	25	169	237	136	309
Pizza	5	48	206	212	45	21	178	238	136	332
Pizza	6	41	191	194	43	22	161	239	116	279
Pizza	7	39	198	206	49	24	163	242	141	351
Pizza	8	47	179	191	46	24	156	227	114	289
Pizza	9	44	173	184	38	21	156	194	134	308
Pizza	10	43	199	202	38	19	165	233	136	285
Pizza	11	35	171	183	40	22	153	205	128	302
Pizza	12	41	175	184	44	24	157	203	107	310
Pizza	13	43	199	198	42	21	163	231	130	277
Pizza	14	42	204	216	50	23	181	261	146	347
Pizza	15	55	194	203	46	23	163	239	125	307
Pizza	16	56	184	196	37	19	168	222	133	276
Pizza	17	56	189	195	36	19	170	214	136	288
Pizza	18	50	195	207	39	19	178	240	136	290
Spaghetti	1	33	133	137	22	16	125	150	102	192
Spaghetti	2	36	147	152	20	13	138	166	125	189
Spaghetti	3	52	145	144	22	15	129	156	95	200
Spaghetti	4	53	140	144	24	16	134	153	105	202
Spaghetti	5	31	144	149	34	23	135	159	99	267
Spaghetti	6	34	142	142	14	10	130	150	112	183
Spaghetti	7	29	151	148	23	16	140	160	59	175
Spaghetti	8	26	145	149	28	19	133	156	110	243
Spaghetti	9	17	132	133	12	9	122	144	113	152
Spaghetti	10	24	142	143	13	9	133	157	125	164
Spaghetti	11	15	139	145	22	15	129	148	122	201
Spaghetti	12	12	143	156	24	16	140	164	136	206
Spaghetti	13	21	180	180	24	14	161	194	127	221
Spaghetti	14	28	163	159	40	25	140	188	76	228
Spaghetti	15	19	134	131	20	15	114	147	90	170
Spaghetti	16	24	165	152	28	18	121	176	105	182
Spaghetti	17	21	127	140	51	37	122	155	72	338
Spaghetti	18	30	136	133	26	19	123	143	29	170

Table 9. (cont'd) Summary Statistics of POTASSIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Sausage	1	70	201	206	41	20	184	226	136	388
Sausage	2	75	207	207	39	19	177	236	127	303
Sausage	3	74	195	191	36	19	175	210	48	282
Sausage	4	64	186	184	30	17	157	201	132	265
Sausage	5	76	197	199	35	17	178	213	105	329
Sausage	6	59	185	188	28	15	168	203	127	279
Sausage	7	64	204	206	24	12	191	220	138	279
Sausage	8	63	191	193	34	18	167	221	124	261
Sausage	9	67	198	200	34	17	179	223	130	284
Sausage	10	71	214	212	37	18	190	237	112	321
Sausage	11	67	207	209	26	13	191	222	152	300
Sausage	12	68	206	212	36	17	191	233	128	335
Sausage	13	60	200	203	29	14	183	215	165	298
Sausage	14	73	231	230	42	18	209	244	157	462
Sausage	15	81	205	209	34	16	189	228	118	322
Sausage	16	73	213	211	27	13	191	228	149	295
Sausage	17	77	212	212	31	15	191	229	140	319
Sausage	18	76	200	199	36	18	182	221	43	283
Soup	1	83	43	67	56	84	21	104	6	186
Soup	2	30	98	93	54	58	42	144	11	197
Soup	3	40	65	81	55	68	27	139	14	178
Soup	4	45	102	94	53	57	48	136	12	179
Soup	5	66	45	65	54	82	20	76	11	193
Soup	6	48	45	61	44	73	25	80	13	209
Soup	7	25	46	79	65	83	24	147	11	187
Soup	8	50	52	92	91	99	28	155	11	528
Soup	9	48	47	66	56	85	25	76	9	244
Soup	10	57	29	66	60	91	21	90	11	207
Soup	11	63	54	77	64	83	26	133	13	298
Soup	12	58	29	48	46	95	19	59	8	207
Soup	13	54	44	69	56	80	29	96	12	238
Soup	14	69	41	65	55	84	22	100	9	202
Soup	15	60	41	59	52	88	20	74	11	254
Soup	16	79	33	53	46	86	23	62	9	212
Soup	17	80	31	59	53	89	20	90	8	192
Soup	18	62	31	58	56	96	18	69	9	222

Table 9. (cont'd) Summary Statistics of POTASSIUM Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Pies	1	43	75	97	53	54	67	93	53	255
Pies	2	44	113	134	67	50	75	213	51	251
Pies	3	50	102	139	63	45	87	193	65	277
Pies	4	44	114	132	62	47	88	160	62	382
Pies	5	43	103	124	55	45	82	160	66	252
Pies	6	42	112	124	52	42	85	143	62	273
Pies	7	31	134	133	43	32	103	154	64	227
Pies	8	40	110	128	53	42	82	167	60	242
Pies	9	39	123	140	58	41	89	185	61	278
Pies	10	34	114	138	70	51	82	169	54	325
Pies	11	38	107	121	64	53	83	141	42	301
Pies	12	36	107	133	64	48	88	157	62	286
Pies	13	27	152	164	66	40	101	235	82	308
Pies	14	47	121	134	55	41	100	156	67	268
Pies	15	42	128	154	67	44	99	229	64	296
Pies	16	34	123	136	52	39	88	192	70	254
Pies	17	33	115	119	51	43	84	125	43	243
Pies	18	30	100	126	58	46	77	173	64	249

Table 10. Overall Summary Statistics of SALT Values in mg/100gm by Product Class.

Product Class	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Ham	1576	2738	2750	550	20	2380	3078	823	5204
Luncheon Meat	510	3404	3356	314	9	3270	3526	2020	4080
Bacon	1105	1505	1518	369	24	1284	1733	275	4111
Bologna	951	2547	2525	378	15	2270	2760	1121	3928
Pizza	602	1400	1410	204	14	1284	1530	786	2340
Spaghetti	412	1125	1130	166	15	1048	1217	550	1898
Sausage	957	1530	1581	282	18	1411	1720	780	2974
Soup	791	915	911	170	19	855	987	15	1791
Pies	563	1105	1094	297	27	883	1270	212	2741

Table 11. Summary Statistics of SALT Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Ham	1	81	2760	2756	580	21	2310	3090	1790	4380
Ham	2	67	2630	2694	608	23	2330	3000	1520	4490
Ham	3	2	2840	2840	170	6	2720	2960	2720	2960
Ham	4	80	2787	2818	553	20	2389	3198	1773	4416
Ham	5	132	2661	2646	504	19	2311	2926	1341	4042
Ham	6	134	2847	2822	554	20	2403	3241	1177	4016
Ham	7	131	2751	2720	592	22	2339	3015	1172	4493
Ham	8	129	2753	2722	521	19	2348	3079	1521	4243
Ham	9	128	2724	2747	540	20	2331	3115	1704	4377
Ham	10	123	2857	2833	570	20	2476	3206	1183	4422
Ham	11	128	2684	2726	611	22	2311	3044	967	4526
Ham	12	120	2723	2771	555	20	2436	3066	1358	5204
Ham	13	103	2689	2653	548	21	2300	2954	823	4439
Ham	14	111	2686	2772	457	16	2403	3110	1821	4047
Ham	15	107	2785	2822	508	18	2487	3149	1690	4277
Luncheon Meat	1	47	3320	3224	281	9	3190	3380	2020	3500
Luncheon Meat	2	48	3330	3277	274	8	3080	3410	2760	3910
Luncheon Meat	3	30	3426	3282	359	11	2914	3526	2693	3899
Luncheon Meat	4	45	3414	3358	198	6	3246	3509	2753	3605
Luncheon Meat	5	43	3565	3476	296	9	3308	3681	2810	4010
Luncheon Meat	6	30	3403	3374	234	7	3288	3500	2713	3793
Luncheon Meat	7	30	3397	3199	511	16	3299	3467	2020	3563
Luncheon Meat	8	32	3463	3473	201	6	3398	3587	2941	3835
Luncheon Meat	9	27	3524	3504	241	7	3371	3681	2624	3822
Luncheon Meat	10	21	3496	3507	183	5	3415	3591	3098	3952
Luncheon Meat	11	39	3419	3346	333	10	3238	3576	2620	3846
Luncheon Meat	12	30	3491	3510	214	6	3363	3642	3109	4011
Luncheon Meat	13	20	3425	3421	121	4	3380	3492	3159	3609
Luncheon Meat	14	31	3429	3449	235	7	3271	3654	3006	3933
Luncheon Meat	15	37	3299	3129	428	14	2954	3403	2251	4080
Bacon	1	78	1560	1589	393	25	1380	1780	500	3040
Bacon	2	75	1510	1582	358	23	1330	1820	970	2640
Bacon	3	0	.	.	.	.	.	.	.	.
Bacon	4	75	1600	1629	402	25	1307	1889	646	2834
Bacon	5	74	1536	1544	341	22	1331	1747	356	2707
Bacon	6	81	1483	1511	349	23	1227	1745	903	2607
Bacon	7	75	1527	1559	294	19	1407	1773	712	2130
Bacon	8	85	1524	1518	371	24	1285	1761	750	2600
Bacon	9	92	1510	1512	449	30	1252	1692	609	4111
Bacon	10	83	1523	1530	366	24	1316	1782	512	2602
Bacon	11	80	1529	1496	296	20	1335	1654	275	2460
Bacon	12	80	1433	1440	347	24	1209	1663	651	2471
Bacon	13	67	1390	1459	355	24	1174	1821	725	2273
Bacon	14	78	1433	1422	338	24	1200	1610	711	2438
Bacon	15	82	1445	1467	429	29	1183	1736	575	2636

Table 11. (cont'd) Summary Statistics of SALT Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Bologna	1	73	2530	2513	305	12	2380	2700	1650	3600
Bologna	2	83	2620	2561	316	12	2400	2740	1580	3230
Bologna	3	3	2122	2141	283	13	1867	2433	1867	2433
Bologna	4	54	2702	2715	455	17	2434	3014	1325	3928
Bologna	5	64	2719	2666	366	14	2437	2956	1682	3496
Bologna	6	64	2550	2547	363	14	2339	2789	1799	3394
Bologna	7	65	2398	2419	352	15	2171	2596	1464	3598
Bologna	8	72	2640	2613	345	13	2315	2829	1909	3545
Bologna	9	67	2580	2554	419	16	2279	2774	1380	3674
Bologna	10	63	2661	2620	340	13	2372	2791	1990	3394
Bologna	11	73	2466	2378	386	16	2139	2639	1375	3295
Bologna	12	69	2568	2486	333	13	2259	2742	1669	3104
Bologna	13	62	2416	2480	412	17	2295	2695	1454	3809
Bologna	14	72	2494	2499	365	15	2238	2812	1552	3192
Bologna	15	67	2264	2361	401	17	2148	2676	1121	3474
Pizza	1	61	1580	1580	177	11	1470	1710	1110	2020
Pizza	2	58	1480	1528	167	11	1410	1660	1210	1920
Pizza	3	3	1256	1289	63	5	1250	1362	1250	1362
Pizza	4	54	1395	1404	198	14	1327	1526	922	1938
Pizza	5	48	1398	1377	170	12	1308	1490	786	1661
Pizza	6	41	1471	1452	193	13	1311	1570	816	1805
Pizza	7	39	1369	1397	198	14	1251	1538	1074	1823
Pizza	8	47	1320	1354	171	13	1240	1434	1029	1901
Pizza	9	44	1401	1401	208	15	1301	1492	953	2340
Pizza	10	43	1418	1416	195	14	1254	1536	1006	1782
Pizza	11	35	1341	1368	188	14	1247	1445	1042	1944
Pizza	12	41	1364	1373	176	13	1256	1489	1093	1823
Pizza	13	43	1273	1239	194	16	1128	1344	840	1670
Pizza	14	42	1310	1335	196	15	1213	1428	832	1733
Pizza	15	3	1253	1363	233	17	1205	1630	1205	1630
Spaghetti	1	33	1160	1139	115	10	1060	1210	850	1340
Spaghetti	2	22	1150	1154	57	5	1110	1180	1060	1320
Spaghetti	3	52	1200	1216	128	10	1130	1297	983	1643
Spaghetti	4	53	1071	1053	154	15	1025	1120	604	1371
Spaghetti	5	31	1141	1118	265	24	1023	1254	550	1898
Spaghetti	6	34	1109	1134	151	13	1051	1186	864	1508
Spaghetti	7	29	1150	1106	127	12	1030	1176	835	1332
Spaghetti	8	26	1189	1158	175	15	1122	1236	615	1487
Spaghetti	9	17	1130	1135	158	14	975	1259	897	1408
Spaghetti	10	24	1118	1082	157	14	1041	1179	582	1244
Spaghetti	11	15	1113	1144	166	15	1021	1253	939	1598
Spaghetti	12	12	1097	1146	113	10	1068	1206	1042	1428
Spaghetti	13	21	1048	1050	86	8	987	1067	926	1347
Spaghetti	14	28	1108	1164	250	22	1041	1152	889	1874
Spaghetti	15	15	1126	1165	172	15	1055	1339	901	1471

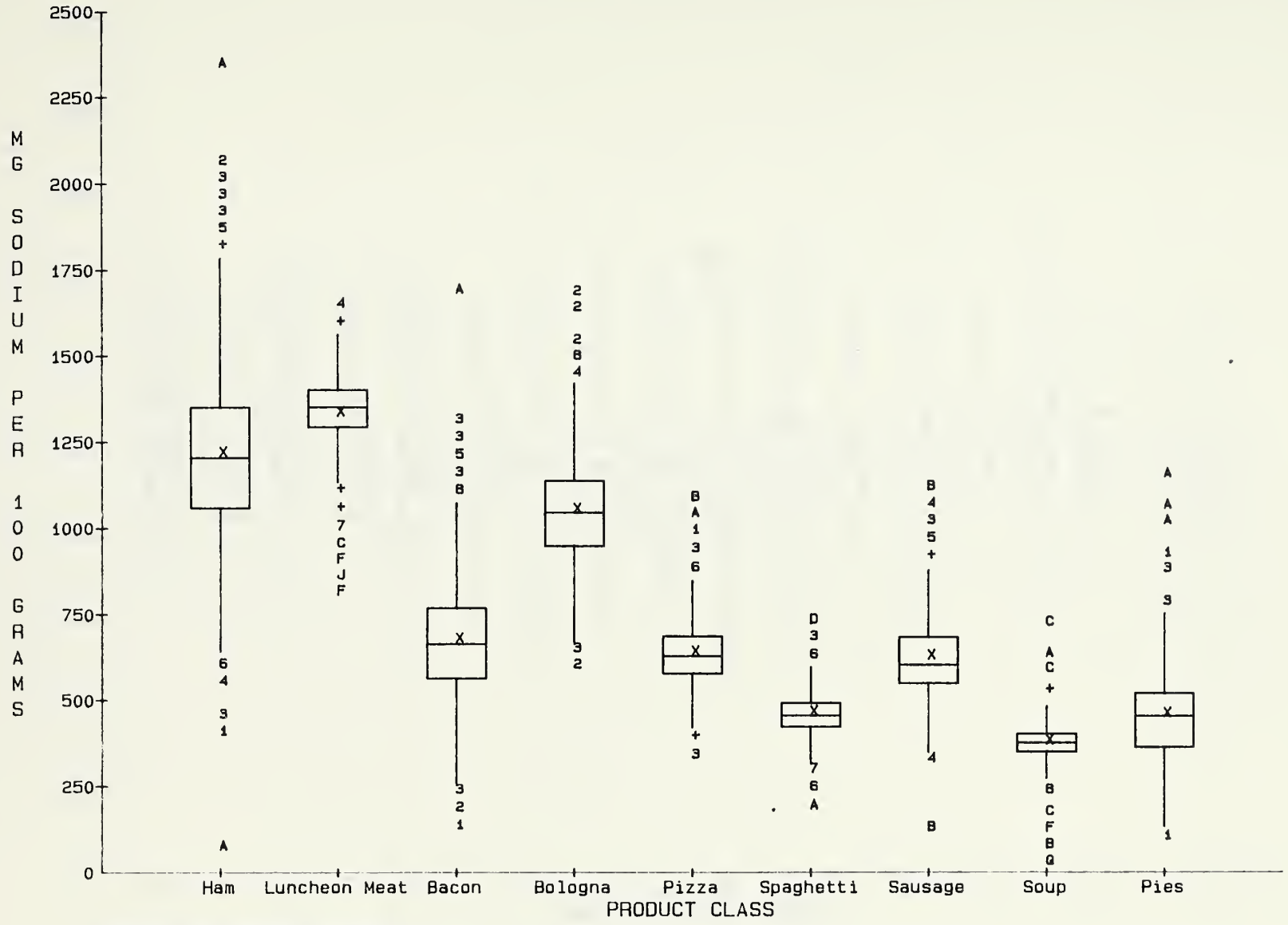
Table II. (cont'd) Summary Statistics of SALT Values in mg/100gm by Product Class and Sampling Cycle.

Product Class	Sampling Cycle	Count	Median	Mean	Standard Deviation	Coefficient of Variation	Lower Quartile	Upper Quartile	Minimum	Maximum
Sausage	1	70	1630	1652	311	19	1440	1850	1020	2570
Sausage	2	75	1490	1576	293	19	1410	1800	780	2230
Sausage	3	0	.	.	.	.	.	.	.	.
Sausage	4	64	1453	1463	298	20	1245	1641	865	2182
Sausage	5	76	1495	1563	234	15	1407	1742	1114	2128
Sausage	6	59	1556	1612	232	14	1480	1691	1243	2344
Sausage	7	64	1546	1595	279	17	1450	1704	813	2375
Sausage	8	63	1522	1548	240	16	1418	1625	965	2223
Sausage	9	67	1534	1577	246	16	1414	1697	1000	2191
Sausage	10	71	1505	1553	285	18	1400	1641	1079	2974
Sausage	11	67	1661	1704	322	19	1520	1849	960	2940
Sausage	12	68	1581	1663	275	17	1482	1847	1162	2597
Sausage	13	60	1566	1588	276	17	1402	1719	1133	2357
Sausage	14	73	1481	1522	266	17	1406	1627	937	2538
Sausage	15	80	1479	1535	302	20	1364	1620	1039	2641
Soup	1	83	930	924	129	14	880	990	60	1180
Soup	2	30	955	939	106	11	860	1010	730	1150
Soup	3	39	901	922	216	23	842	995	300	1645
Soup	4	45	865	837	223	27	778	948	118	1252
Soup	5	66	916	922	84	9	863	972	782	1226
Soup	6	48	914	883	297	34	840	997	102	1714
Soup	7	25	954	952	96	10	883	1000	791	1134
Soup	8	50	902	949	177	19	834	1009	689	1715
Soup	9	48	928	889	164	18	834	1009	351	1154
Soup	10	57	895	891	92	10	837	935	688	1149
Soup	11	63	900	885	133	15	846	942	155	1119
Soup	12	58	930	892	223	25	883	1017	15	1135
Soup	13	54	915	920	172	19	863	989	106	1251
Soup	14	69	926	923	138	15	877	988	122	1196
Soup	15	56	927	950	168	18	878	989	699	1791
Pies	1	43	1140	1143	236	21	960	1370	750	1650
Pies	2	42	1230	1189	279	23	980	1300	690	2080
Pies	3	50	1105	1088	238	22	890	1231	422	1579
Pies	4	44	1075	1083	211	20	925	1251	588	1638
Pies	5	43	1166	1140	249	22	897	1345	683	1680
Pies	6	42	1063	1109	363	33	859	1287	589	2741
Pies	7	31	1154	1134	338	30	905	1339	544	2178
Pies	8	40	1127	1145	264	23	972	1265	586	1906
Pies	9	39	1130	1135	346	31	898	1327	513	2015
Pies	10	34	1181	1101	247	22	952	1288	406	1479
Pies	11	38	1029	1041	512	49	794	1296	212	2612
Pies	12	36	1079	1058	252	24	908	1251	633	1680
Pies	13	27	904	987	248	25	820	1129	642	1730
Pies	14	47	962	952	234	25	736	1155	584	1485
Pies	15	7	1015	1056	232	22	839	1292	796	1325

Table 12. Sodium versus Salt Regression Results

Product Class	Number of Observations	Slope	Intercept (mg/100gm)	R-Squared (%)	Residual Standard Deviation (mg/100gm)
Smoked, Cooked or Canned Ham	1576	0.40	104	89	77
Canned Luncheon Meat	510	0.32	256	78	54
Pumped Bacon	1105	0.41	51	90	51
Meat or Poultry Bologna	951	0.33	214	75	72
Pizza with Meat	602	0.33	169	55	61
Spaghetti Products with Meat or Poultry	412	0.37	47	85	26
Fresh Pork Sausage	957	0.37	39	88	39
Canned Soups with Meat or Poultry	791	0.41	2	92	21
Meat or Poultry Pies	563	0.39	28	89	42

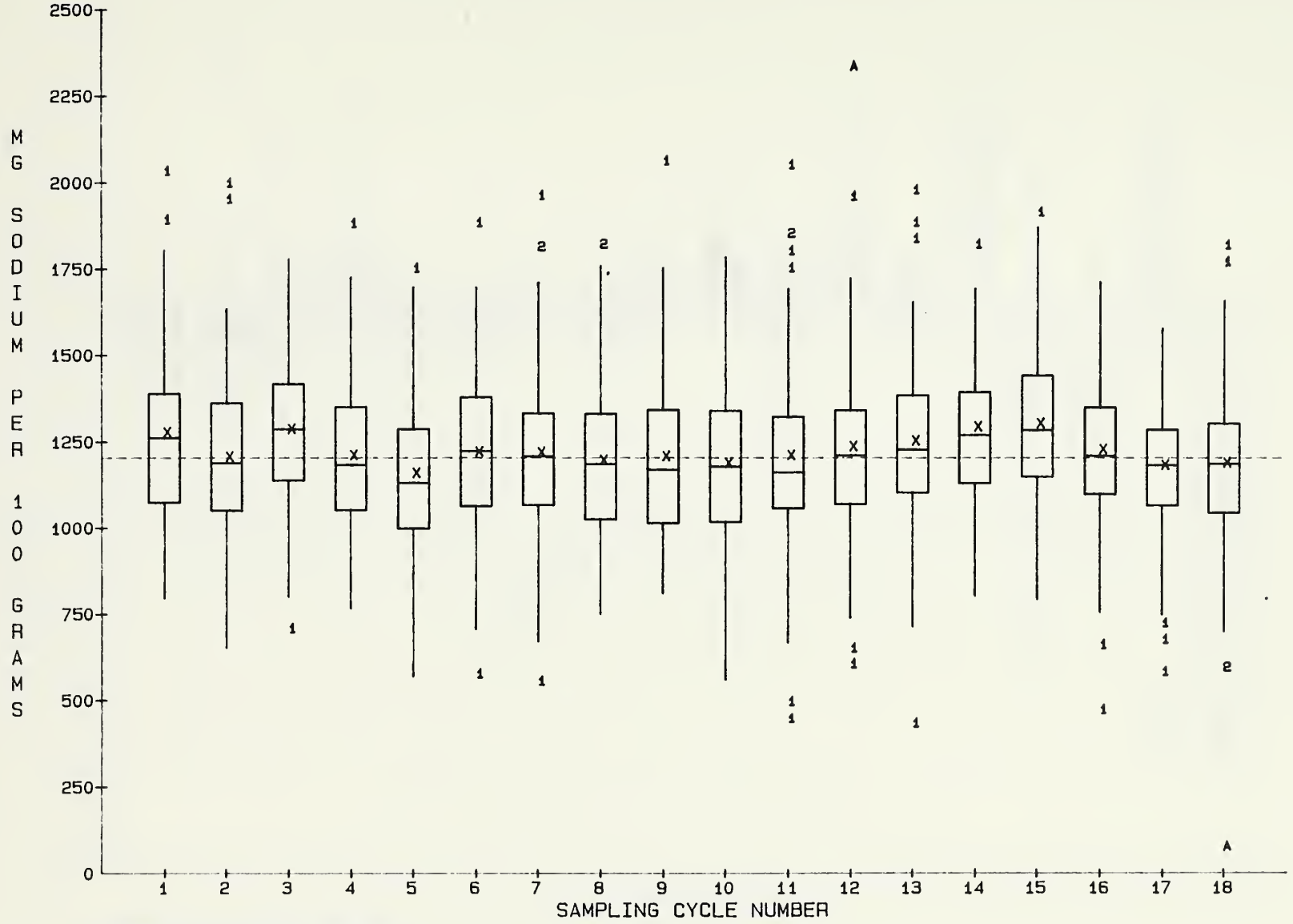
Figure 1. Boxplots of Sodium vs Product Class - Combined Data Sampling Cycles 1 - 18.



Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

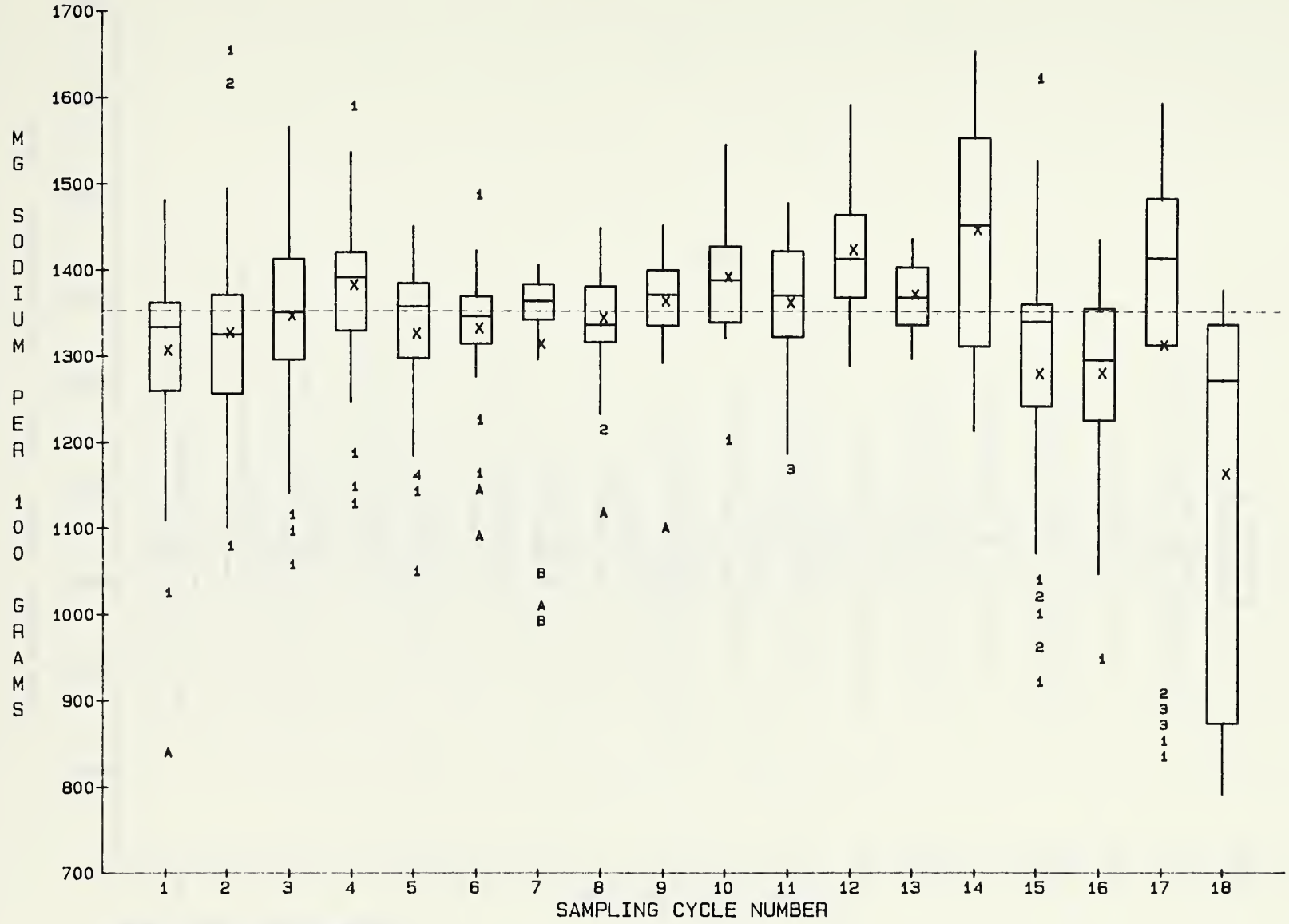
Figure 2. Boxplots of Sodium vs Sampling Cycle - HAM Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

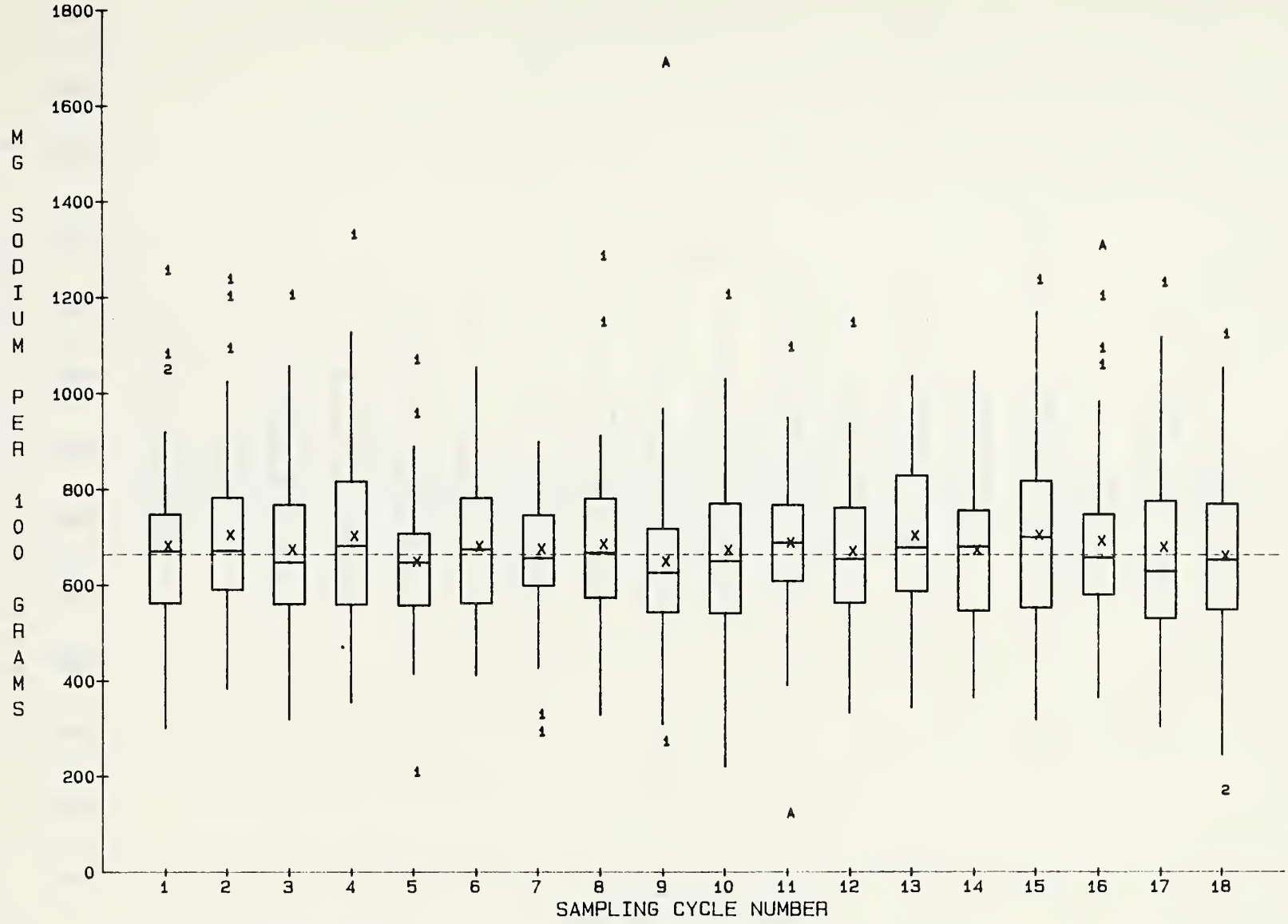
Figure 3. Boxplots of Sodium vs Sampling Cycle - CANNED LUNCHEON MEAT Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

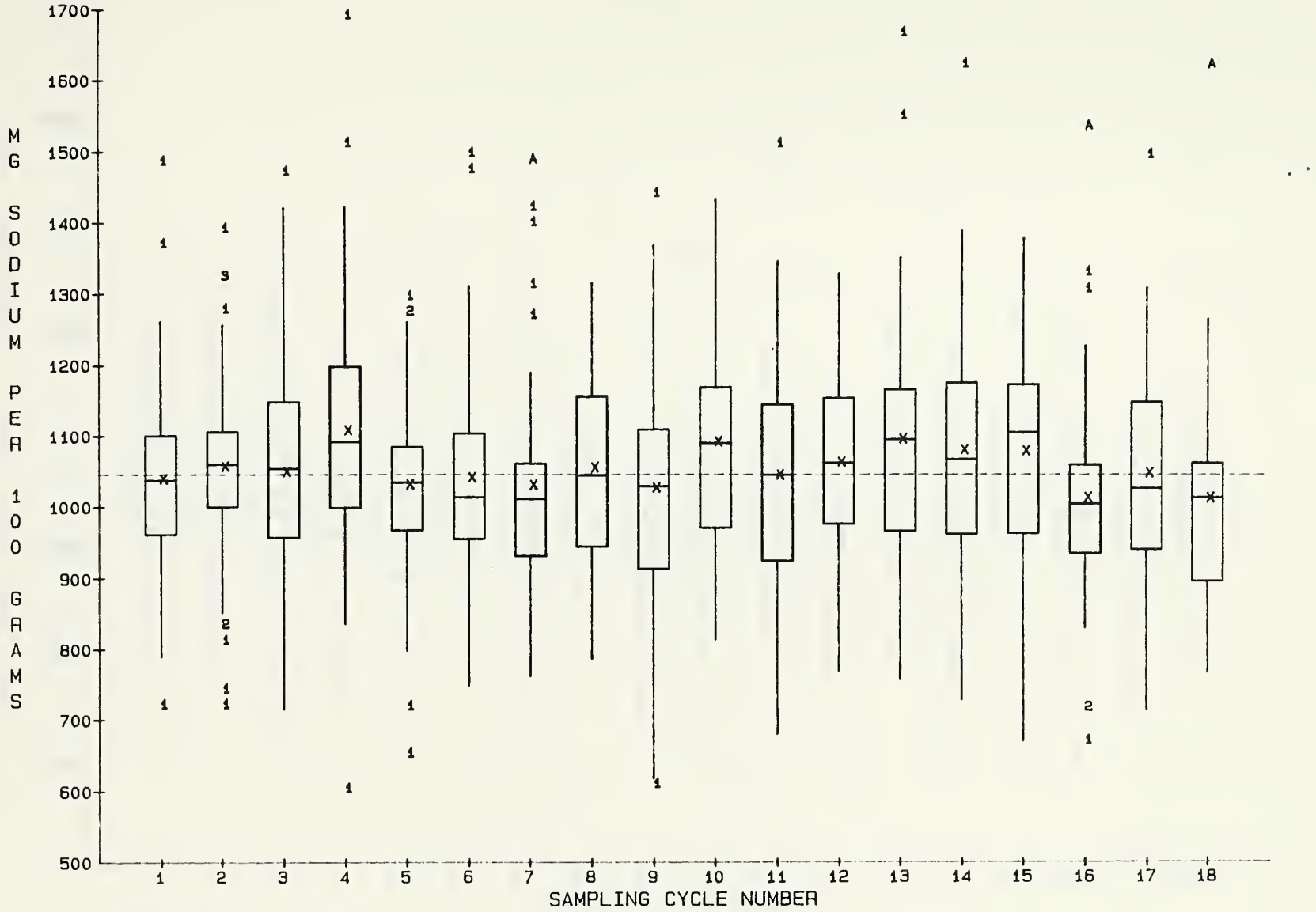
Figure 4. Boxplots of Sodium vs Sampling Cycle - BACON Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

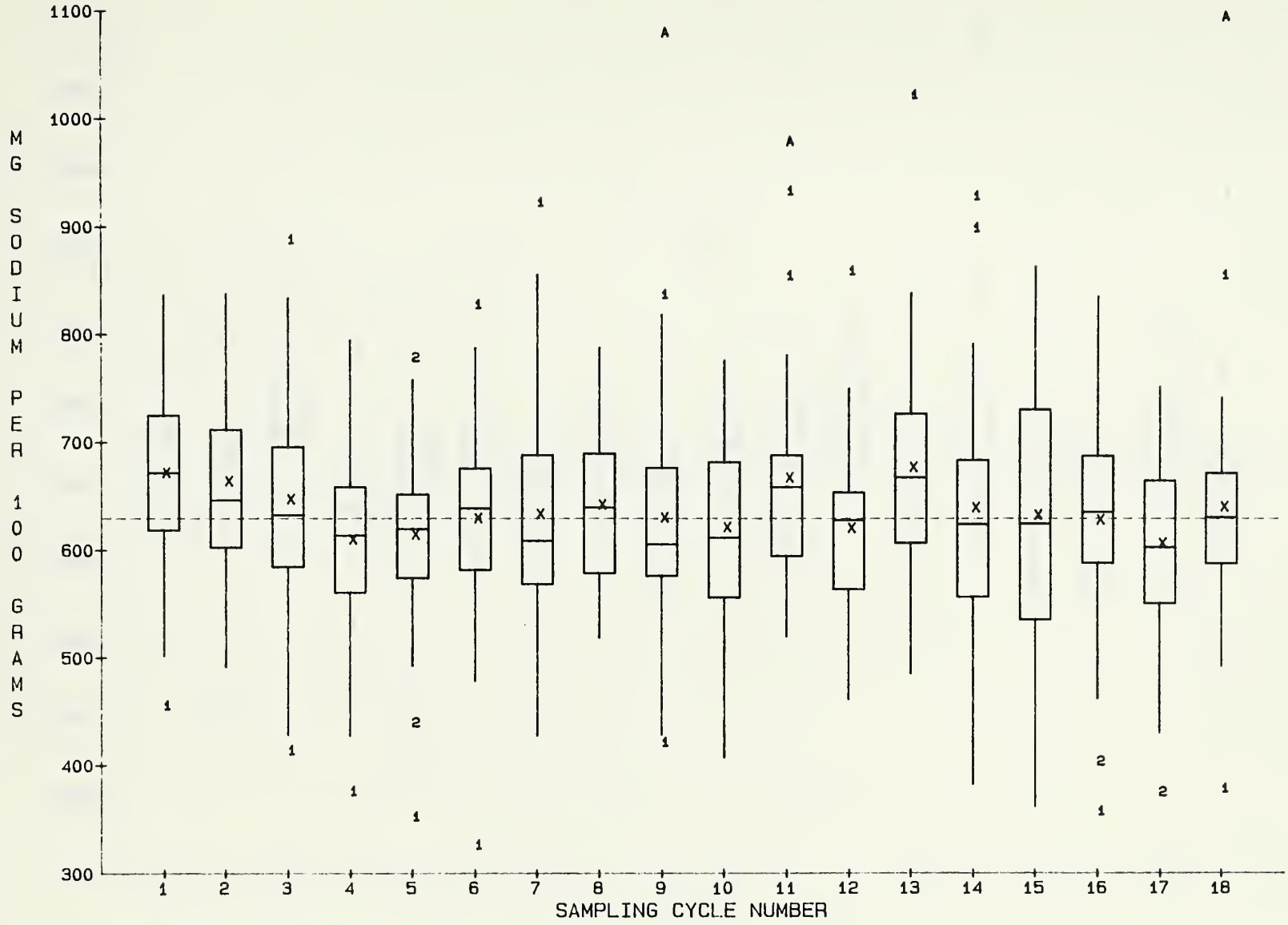
Figure 5. Boxplots of Sodium vs Sampling Cycle - BOLOGNA Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

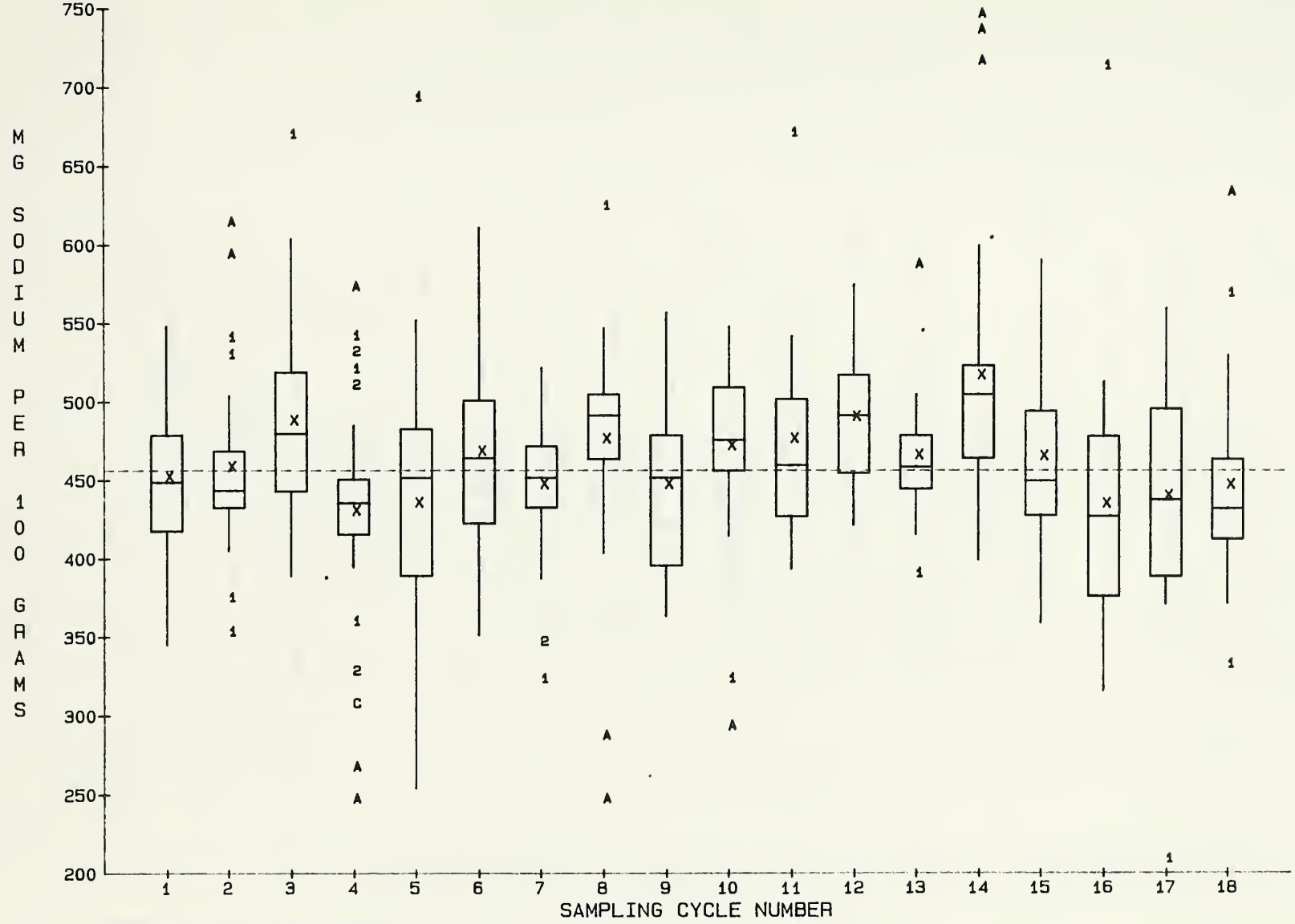
Figure 6. Boxplots of Sodium vs Sampling Cycle - PIZZA Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

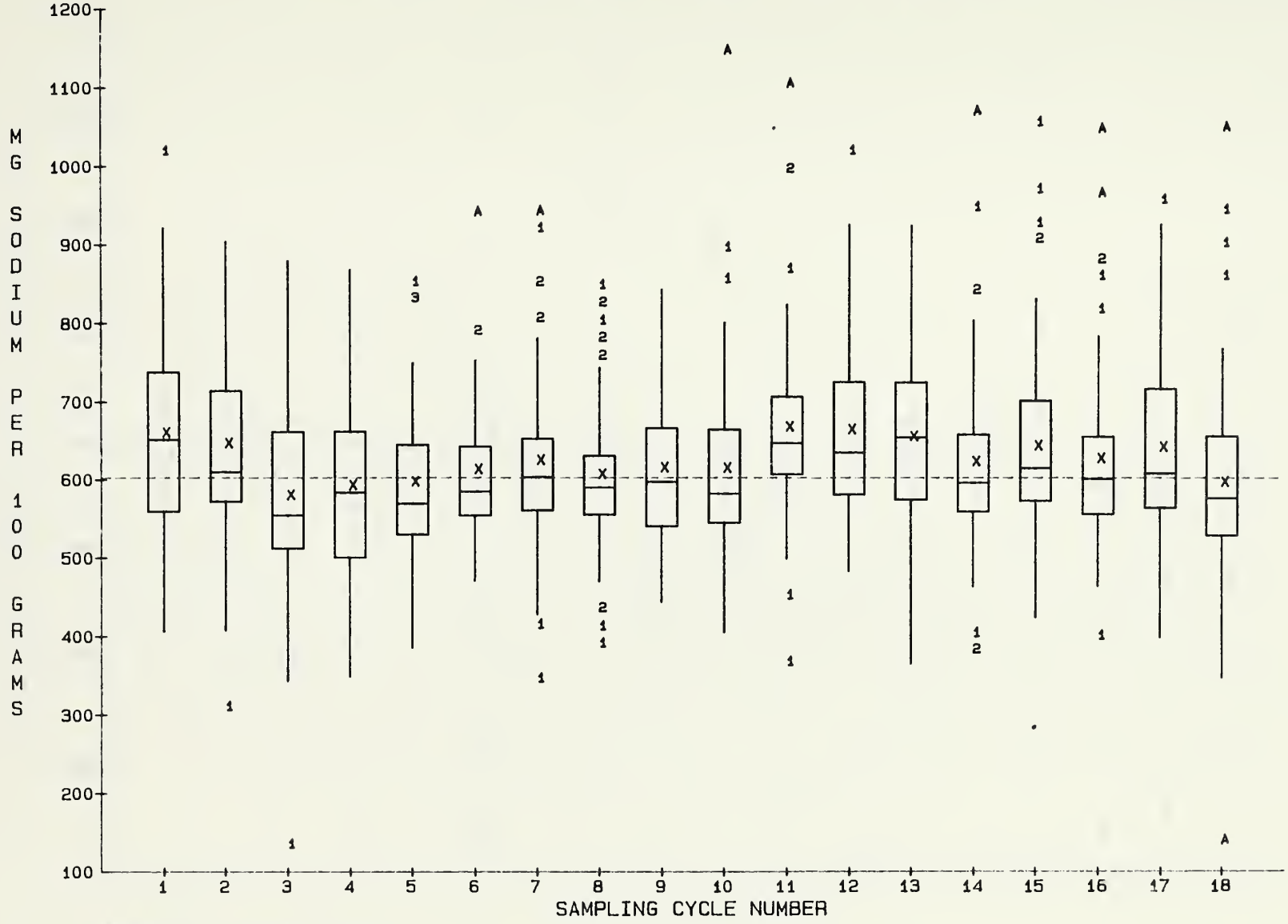
Figure 7. Boxplots of Sodium vs Sampling Cycle - SPAGHETTI Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

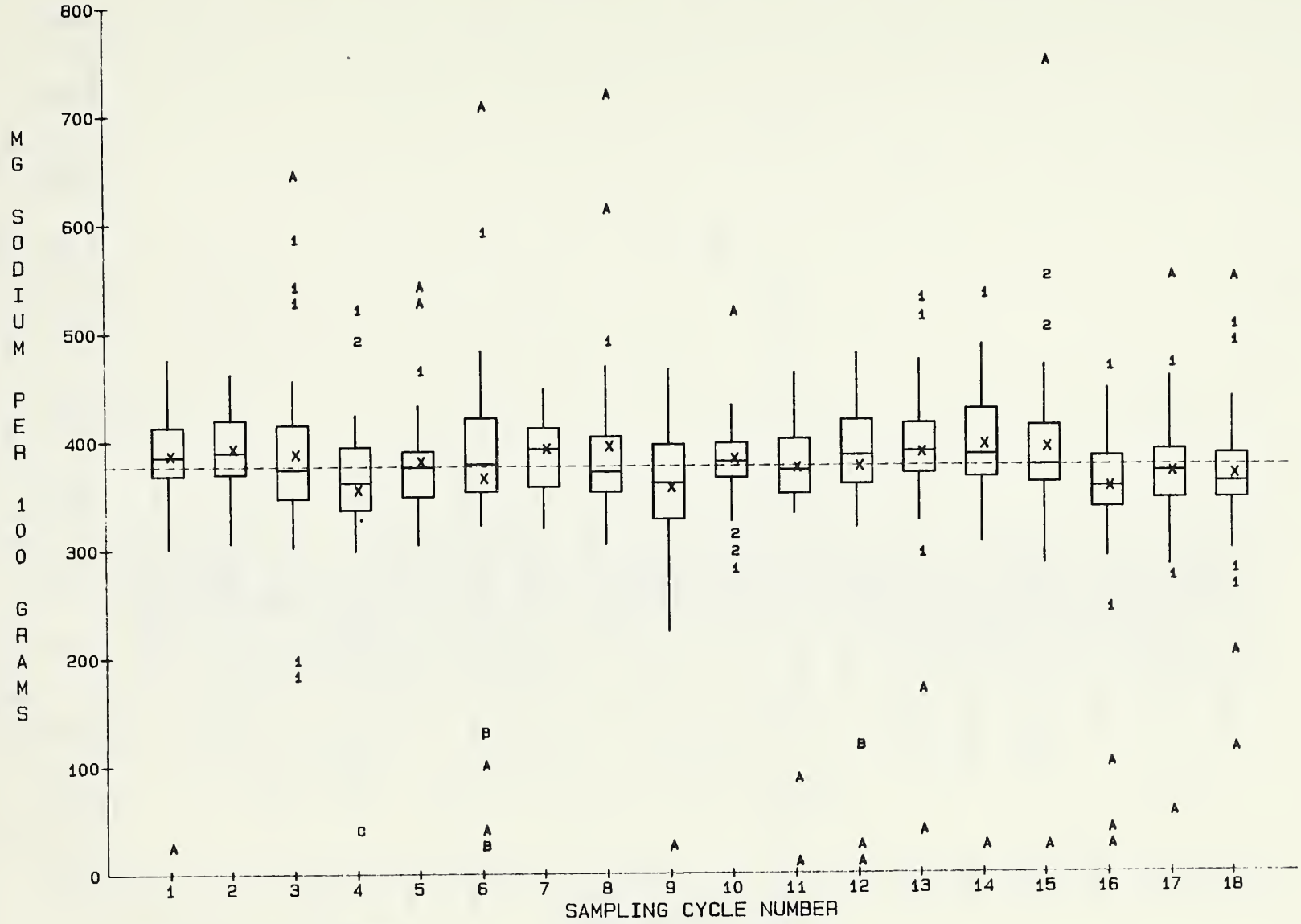
Figure 8. Boxplots of Sodium vs Sampling Cycle - SAUSAGE Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

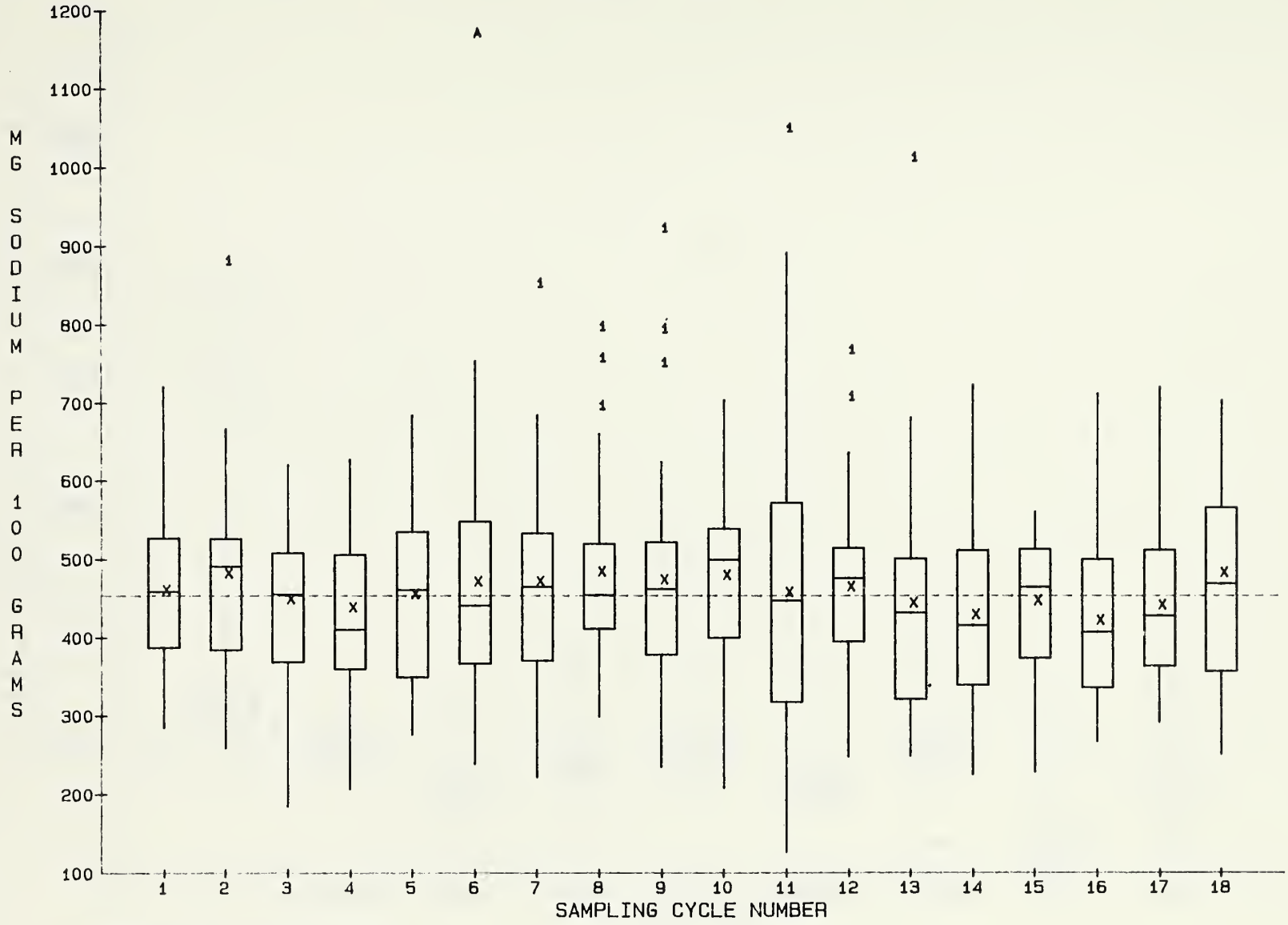
Figure 9. Boxplots of Sodium vs Sampling Cycle - SOUP Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

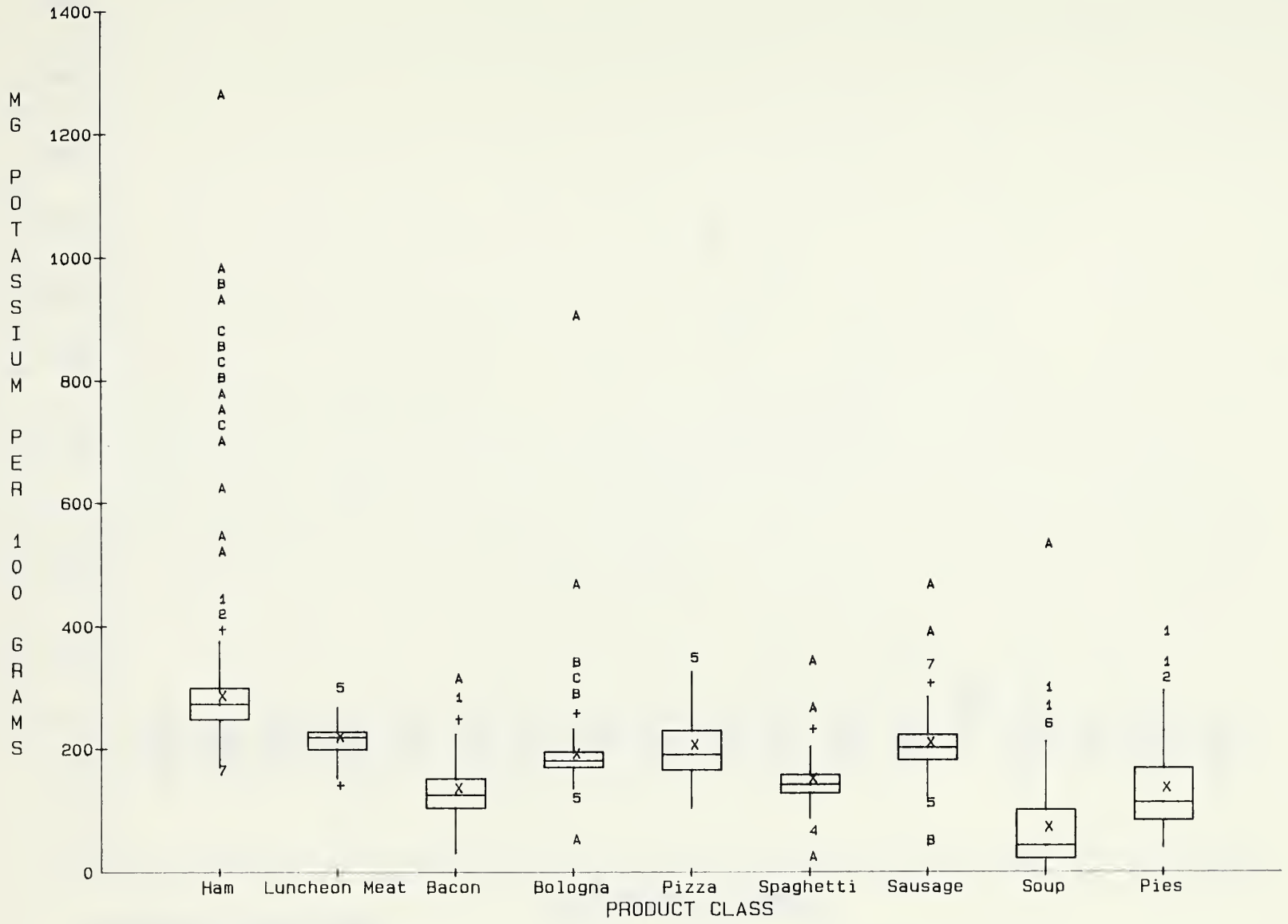
Figure 10. Boxplots of Sodium vs Sampling Cycle - PIES Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

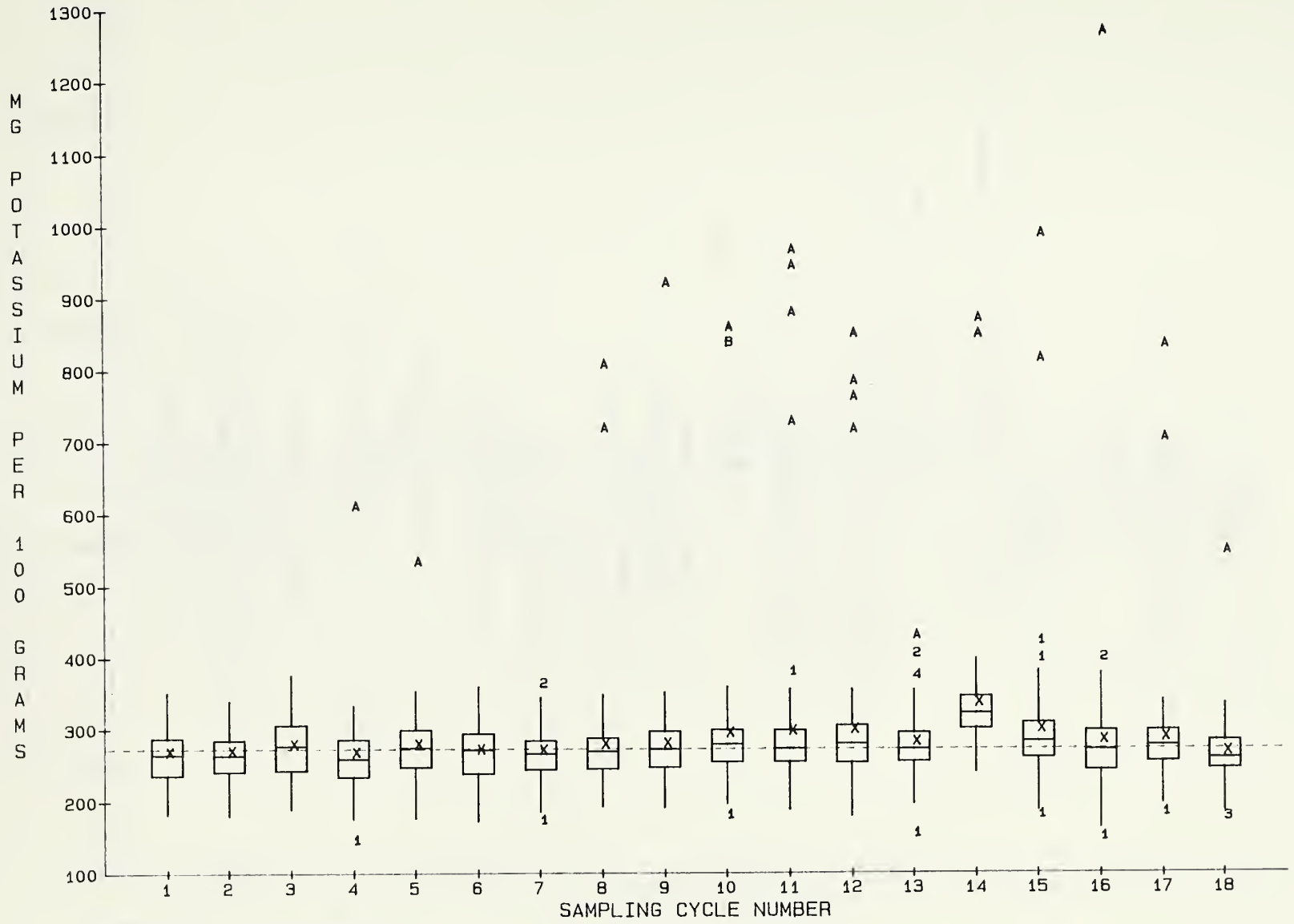
Figure 11. Boxplots of Potassium vs Product Class - Combined Data Sampling Cycles 1 - 18.



Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

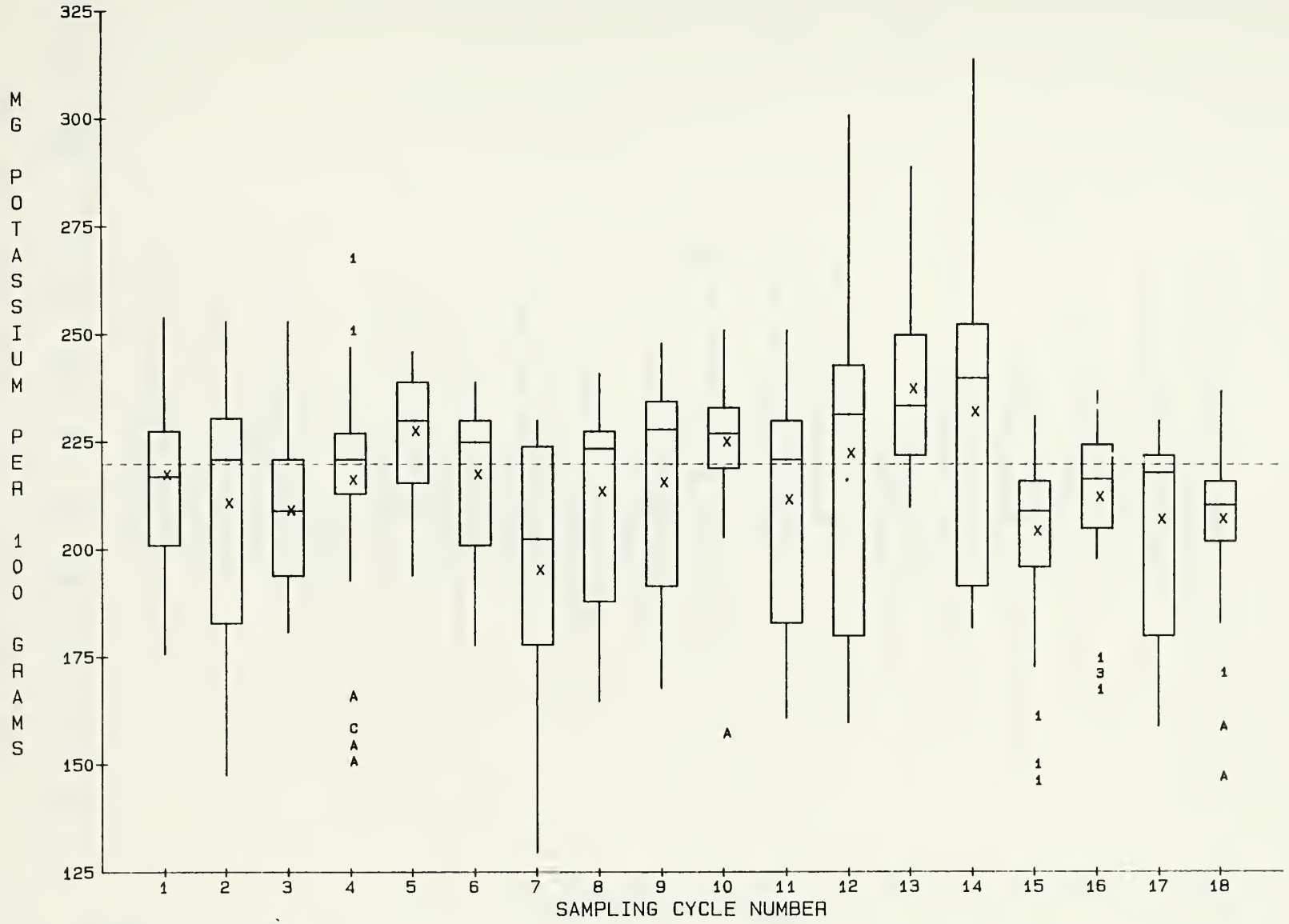
Figure 12. Boxplots of Potassium vs Sampling Cycle - HAM Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

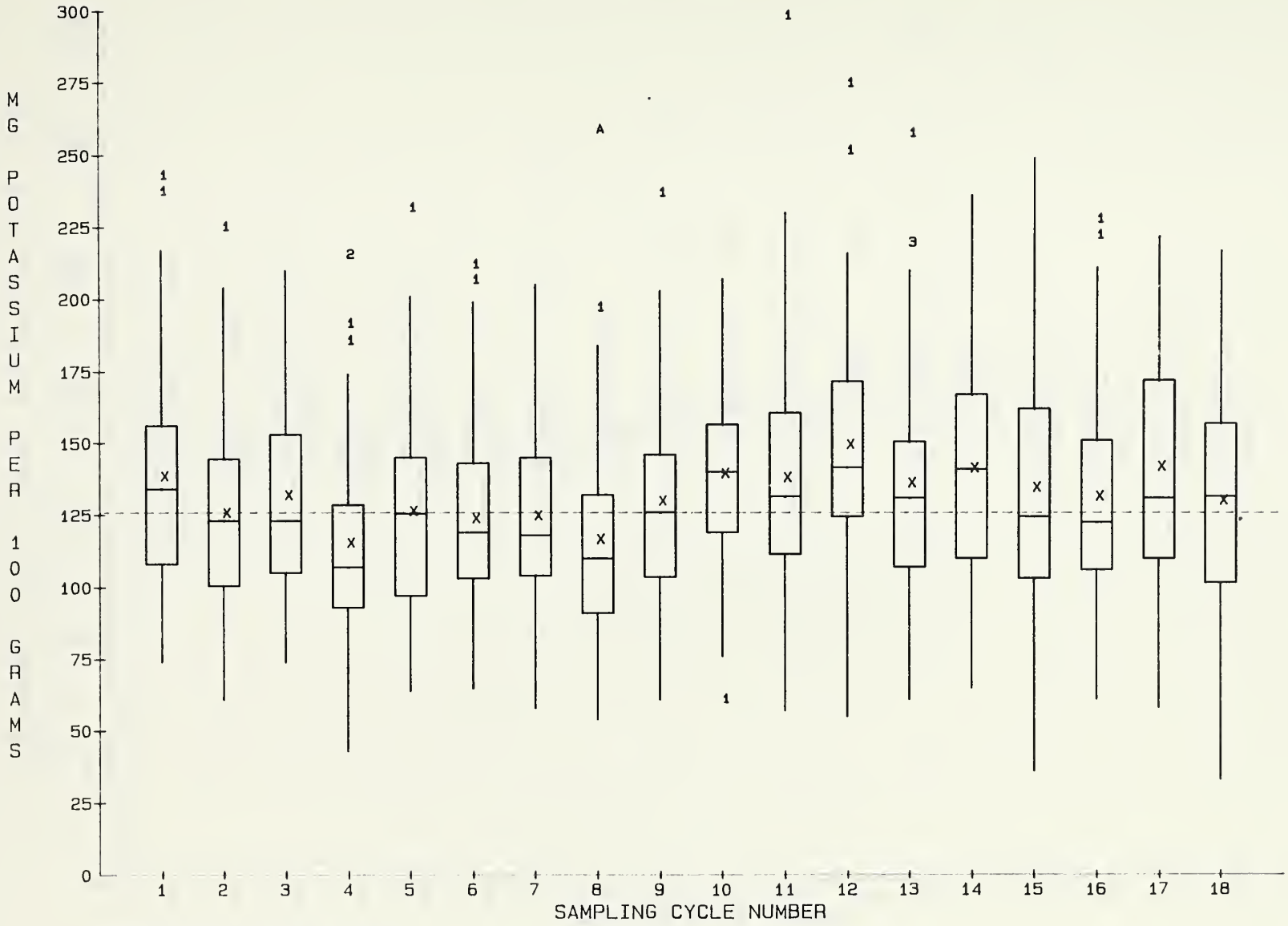
Figure 13. Boxplots of Potassium vs Sampling Cycle - CANNED LUNCHEON MEAT Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

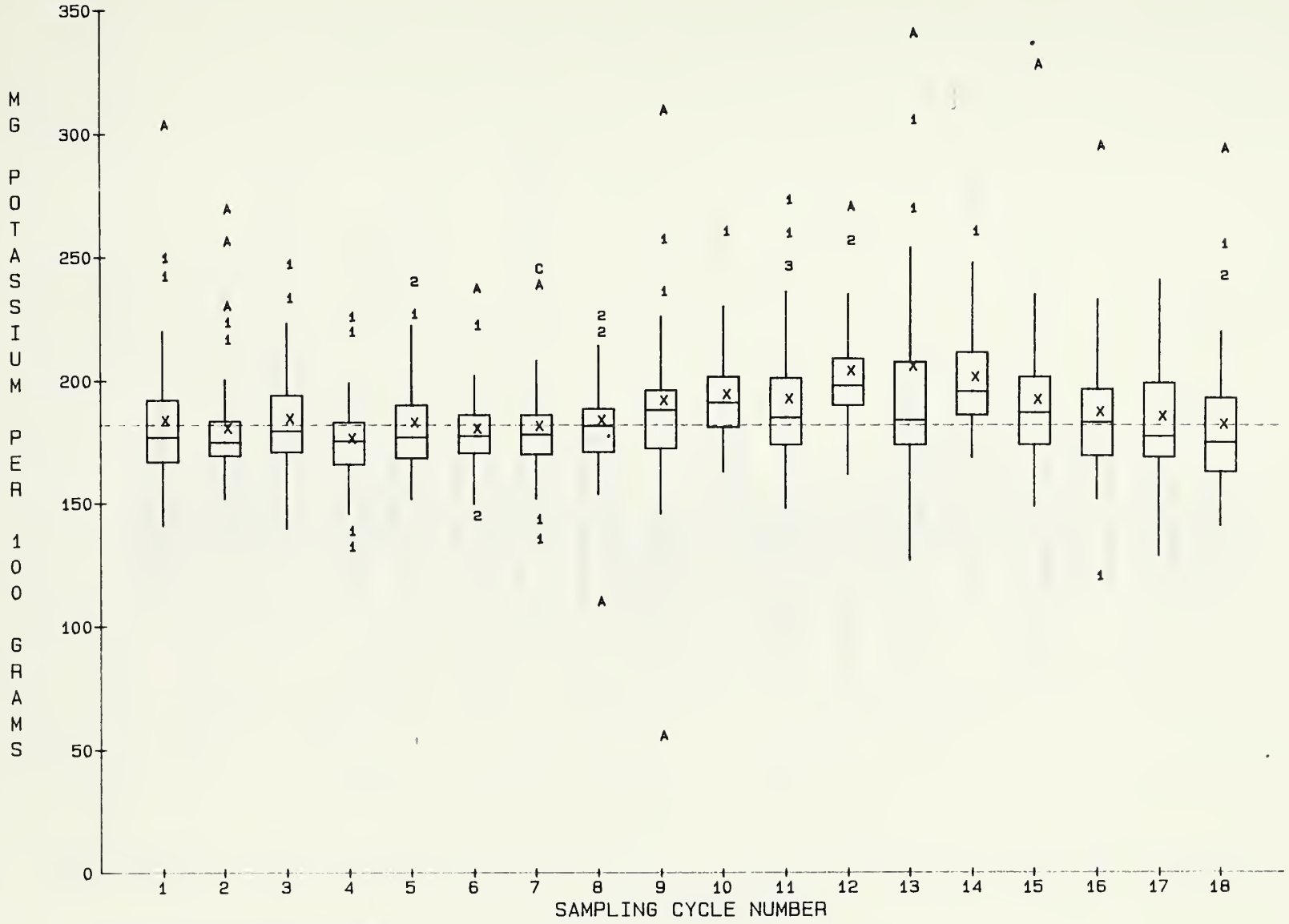
Figure 14. Boxplots of Potassium vs Sampling Cycle - BACON Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

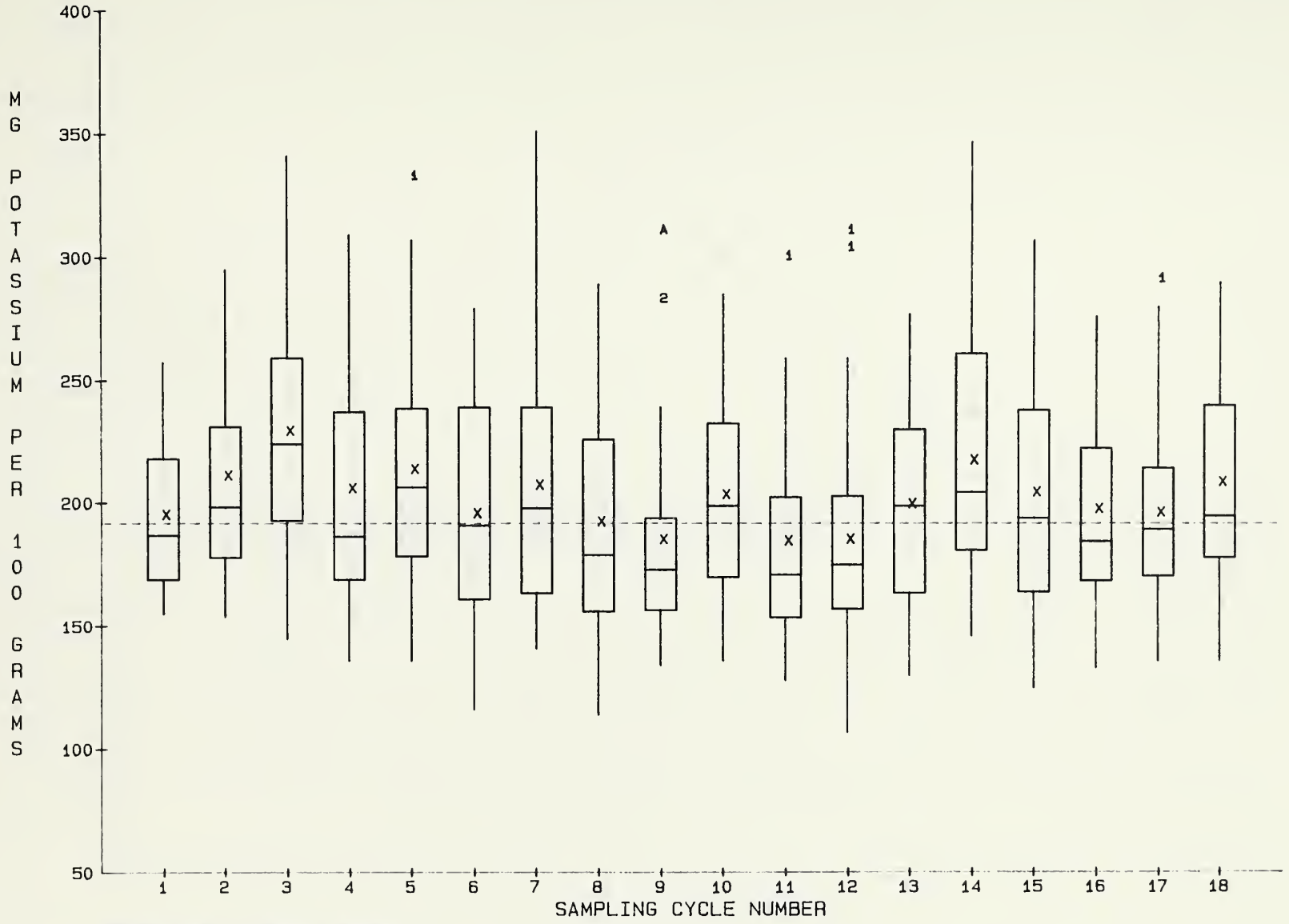
Further explanation of the boxplots is given in Appendix B.

Figure 15. Boxplots of Potassium vs Sampling Cycle - BOLOGNA Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.
Note: Two observations not plotted (456 mg/100gm in cycle 9 and 896 mg/100gm in cycle 13).
Further explanation of the boxplots is given in Appendix B.

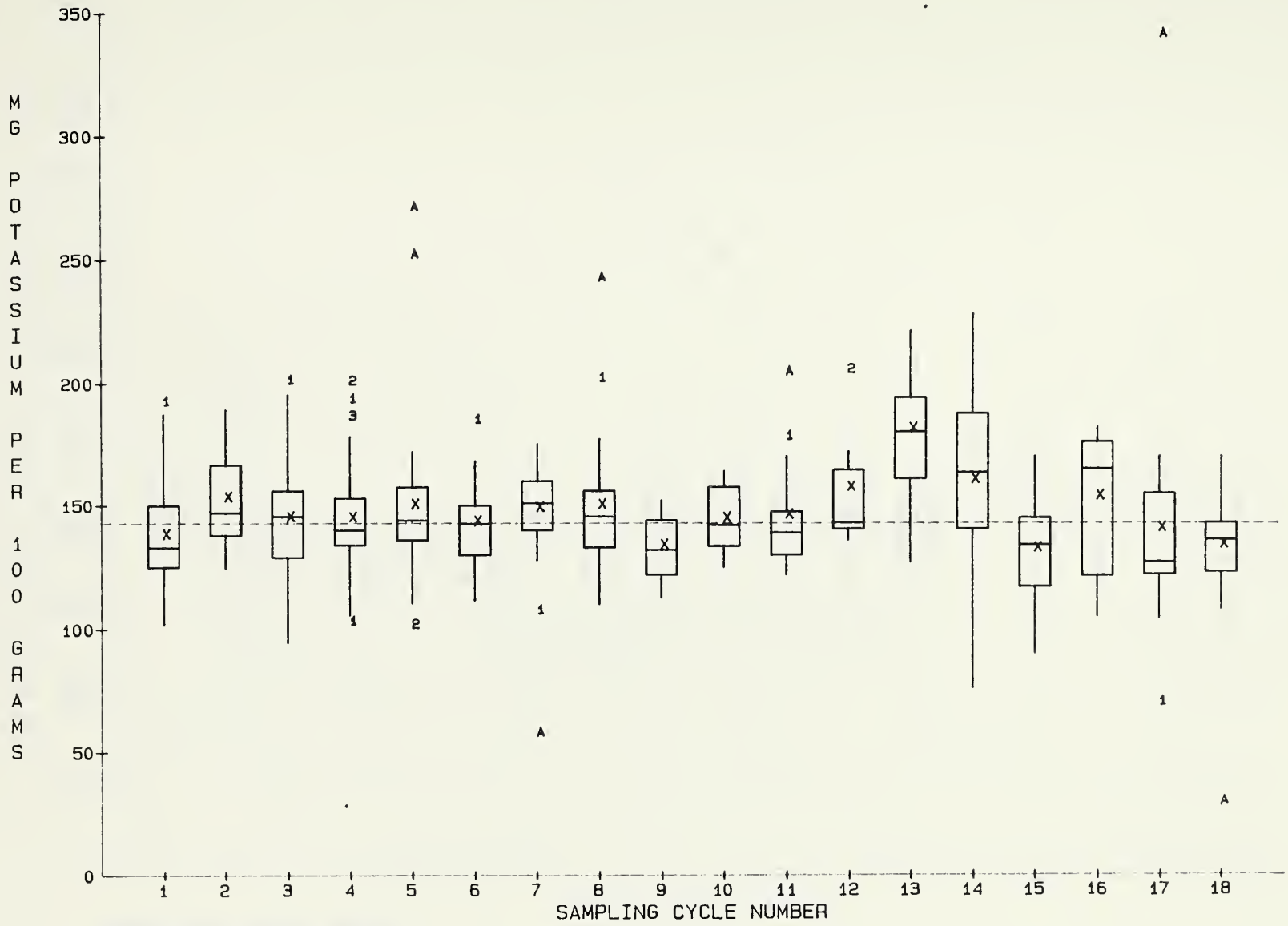
Figure 16. Boxplots of Potassium vs Sampling Cycle - PIZZA Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

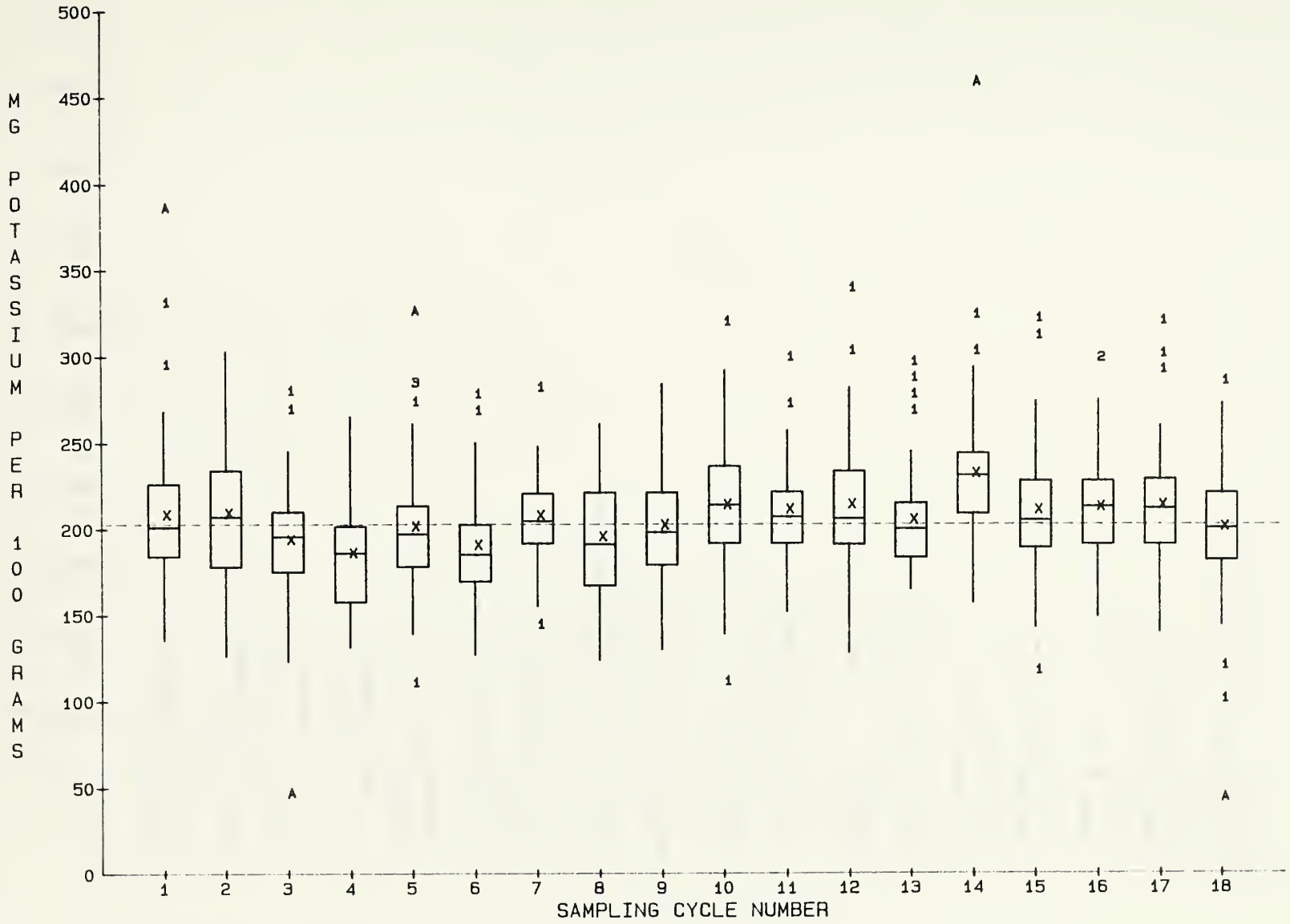
Figure 17. Boxplots of Potassium vs Sampling Cycle - SPAGHETTI Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

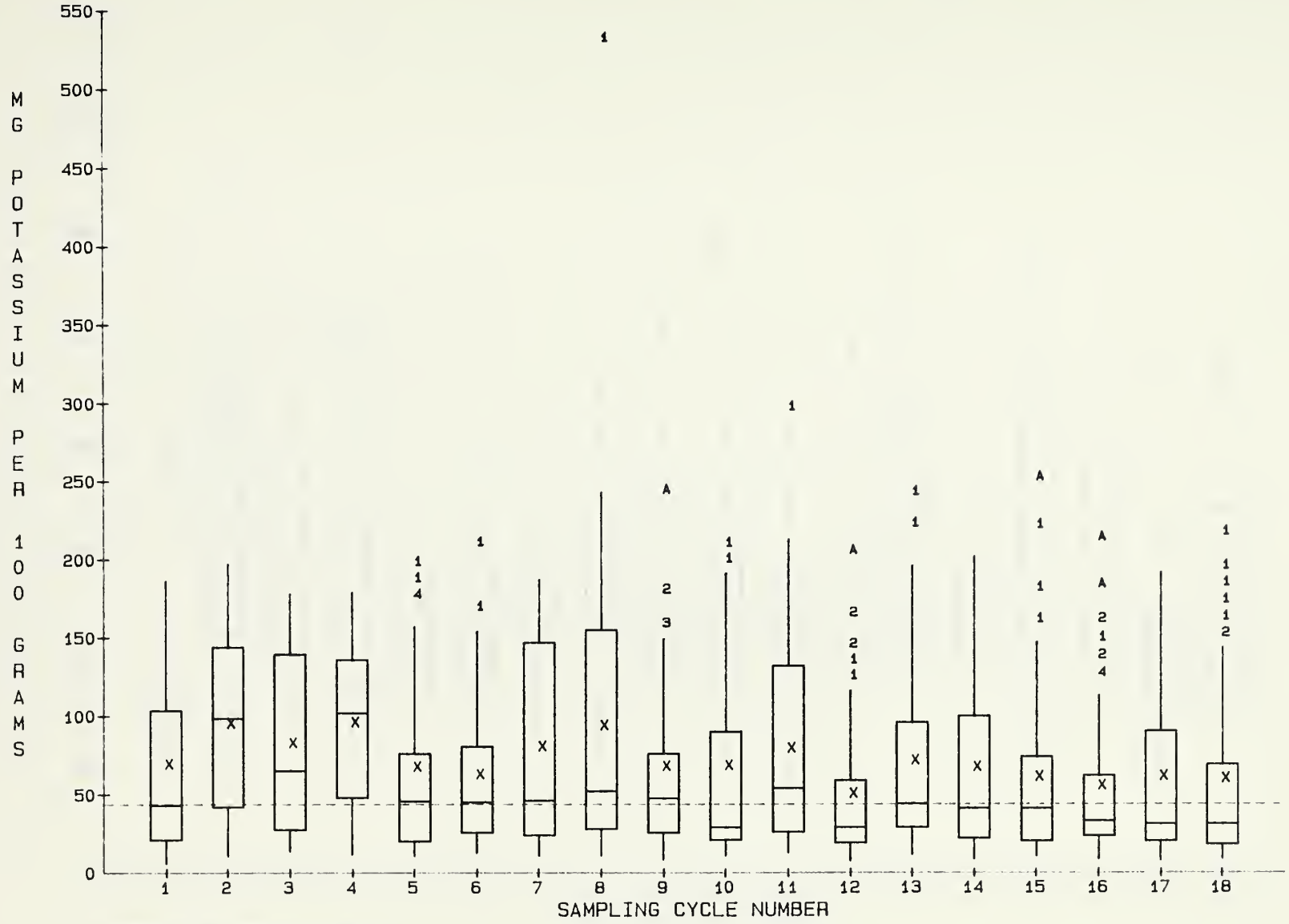
Figure 18. Boxplots of Potassium vs Sampling Cycle - SAUSAGE Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

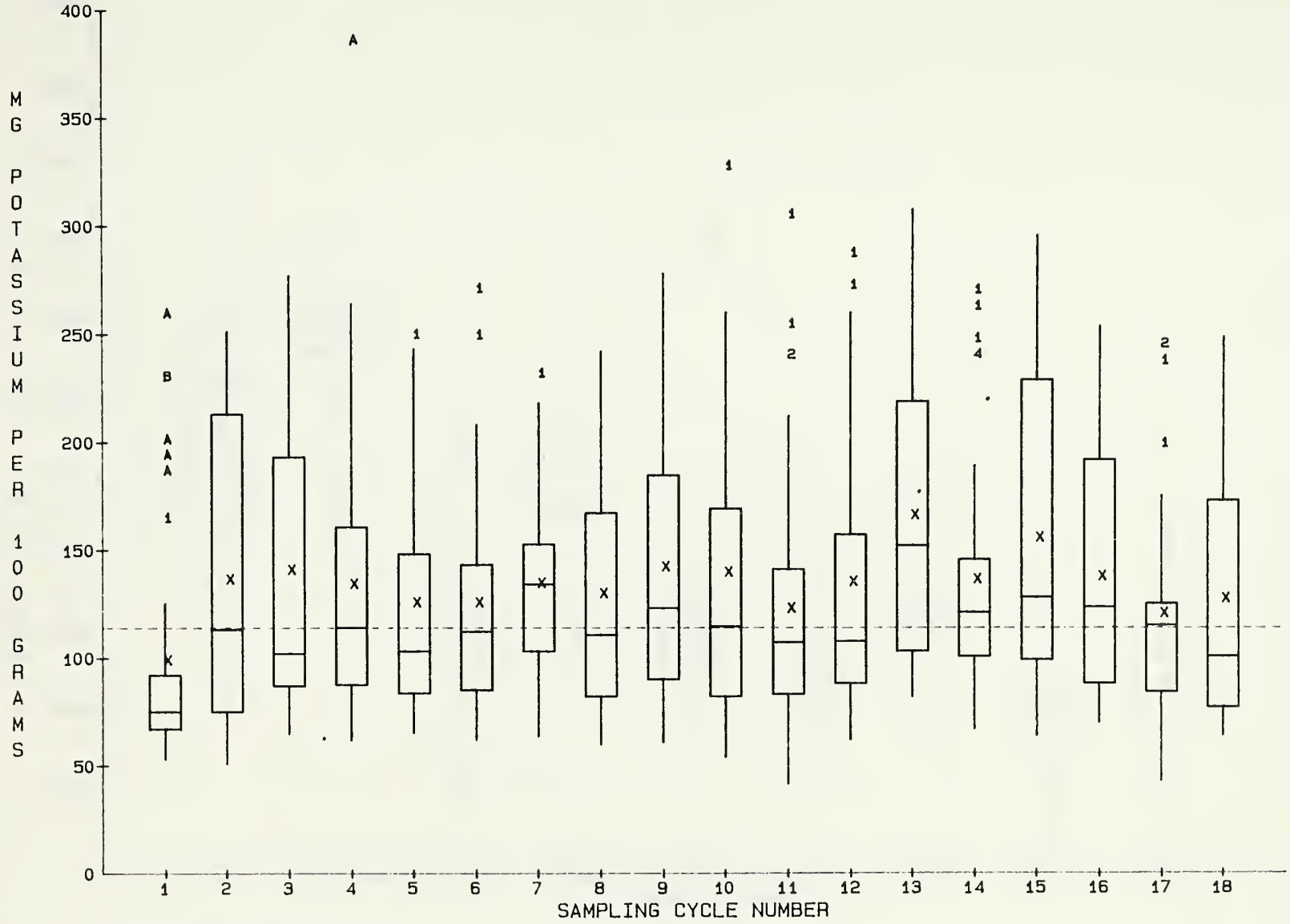
Figure 19. Boxplots of Potassium vs Sampling Cycle - SOUP Product Class



Deshed Line - Overall Median.
Solid Line Within Box - Medien.
Symbol X - Average.

Further explenation of the boxplots is given in Appendix B.

Figure 20. Boxplots of Potassium vs Sampling Cycle - PIES Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

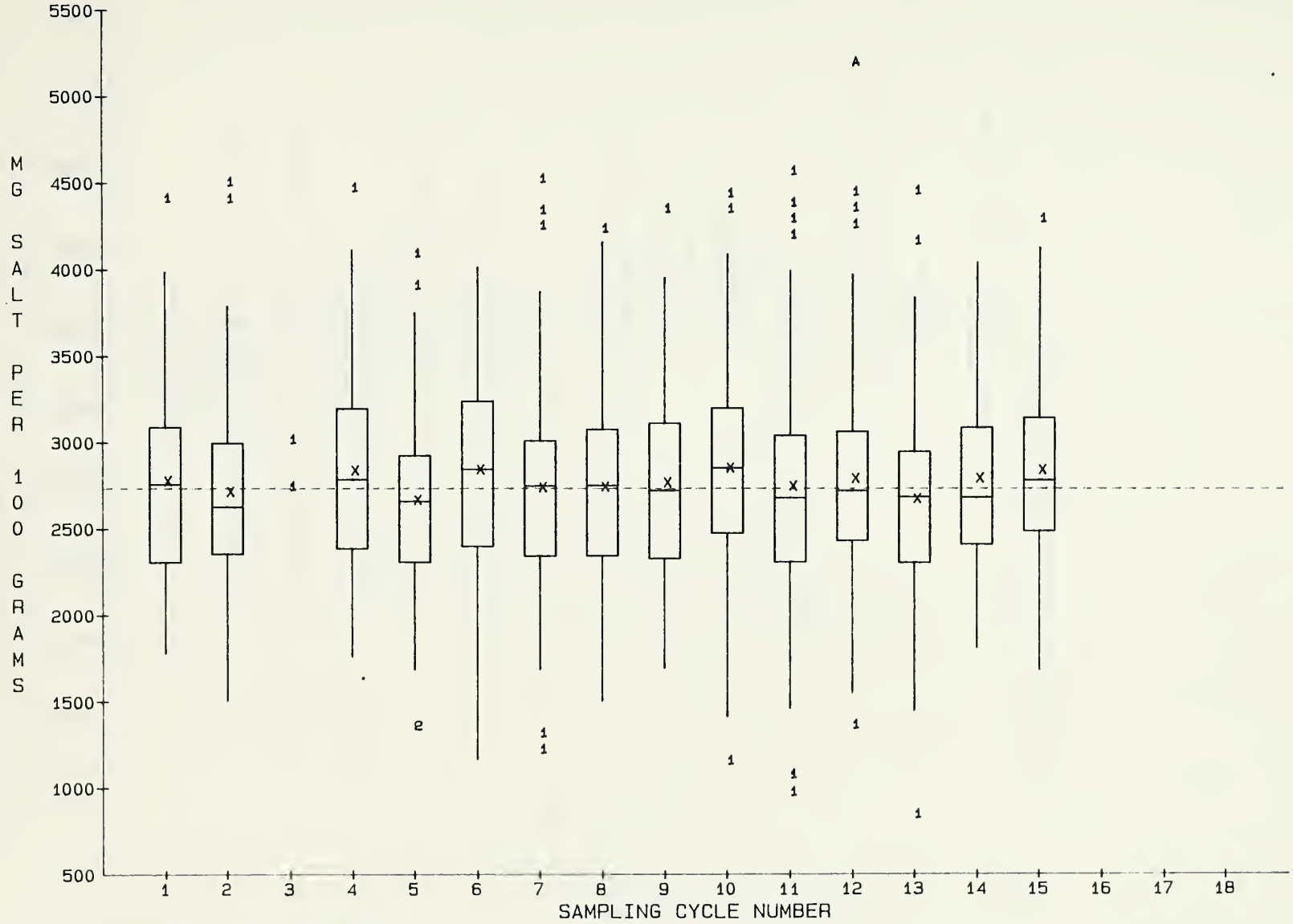
Further explanation of the boxplots is given in Appendix B.

Figure 21. Boxplots of Salt vs Product Class - Combined Data Sampling Cycles 1 - 15.

Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

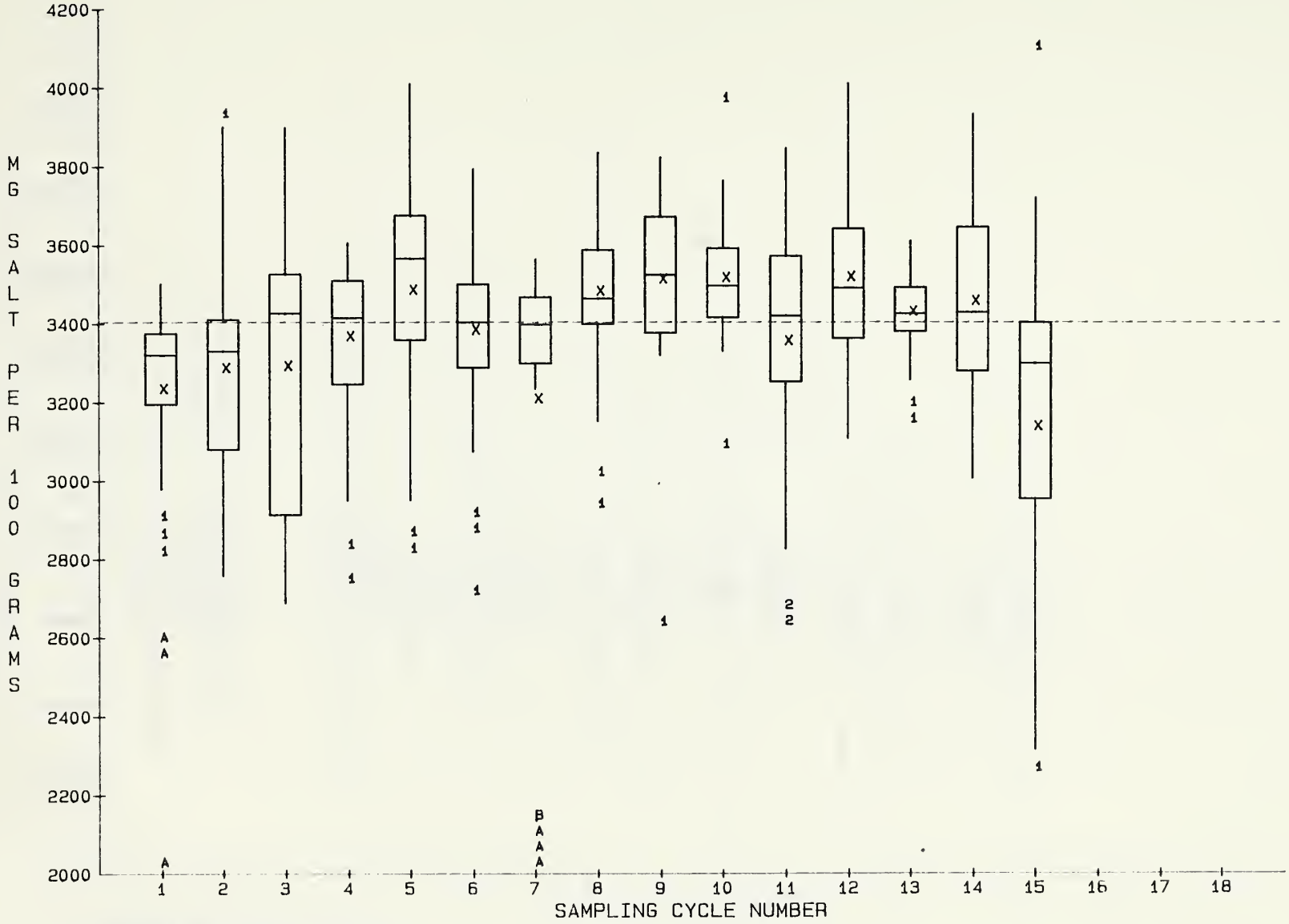
Figure 22. Boxplots of Salt vs Sampling Cycle - HAM Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

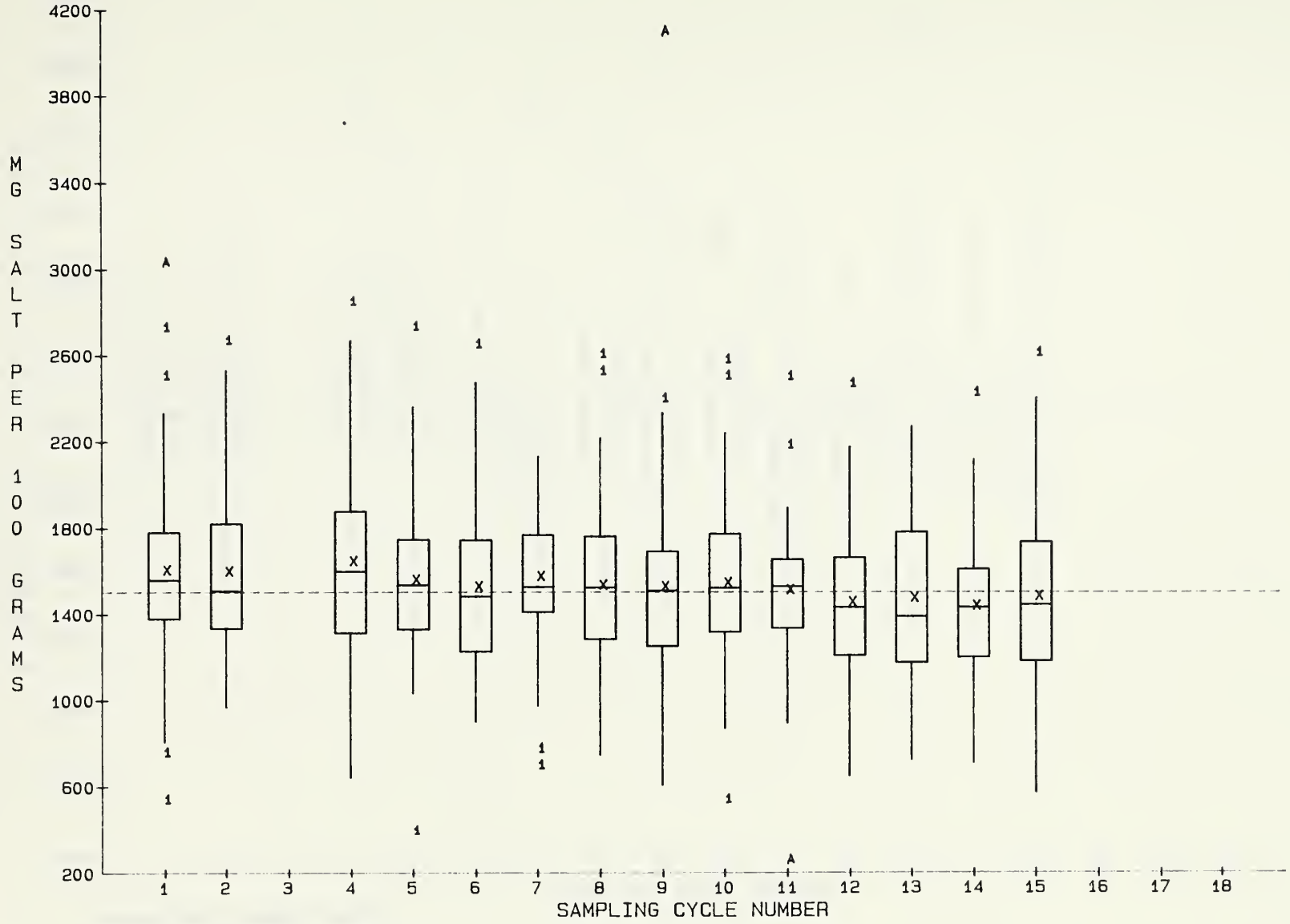
Figure 23. Boxplots of Salt vs Sampling Cycle - CANNED LUNCHEON MEAT Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

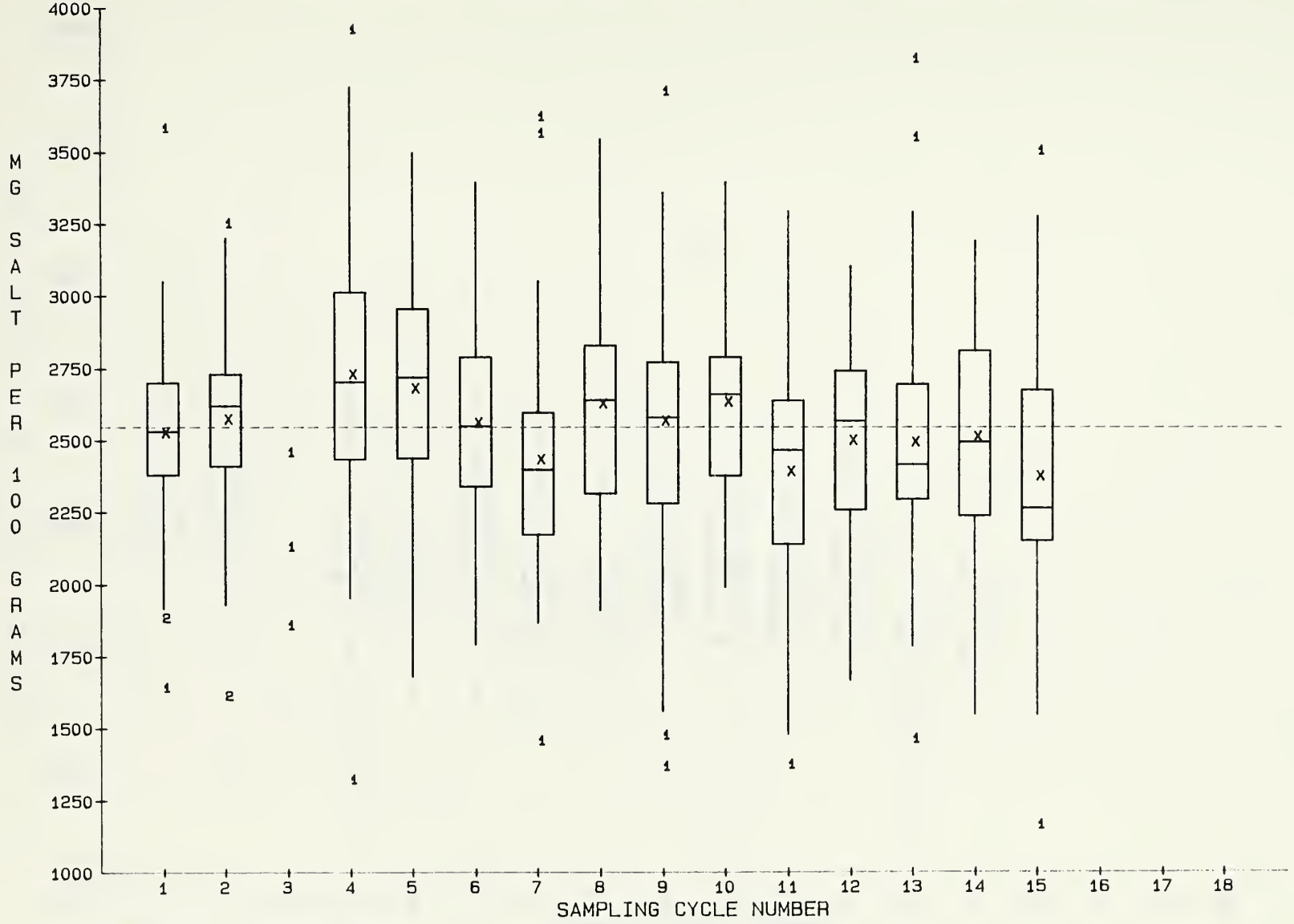
Figure 24. Boxplots of Salt vs Sampling Cycle - BACON Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

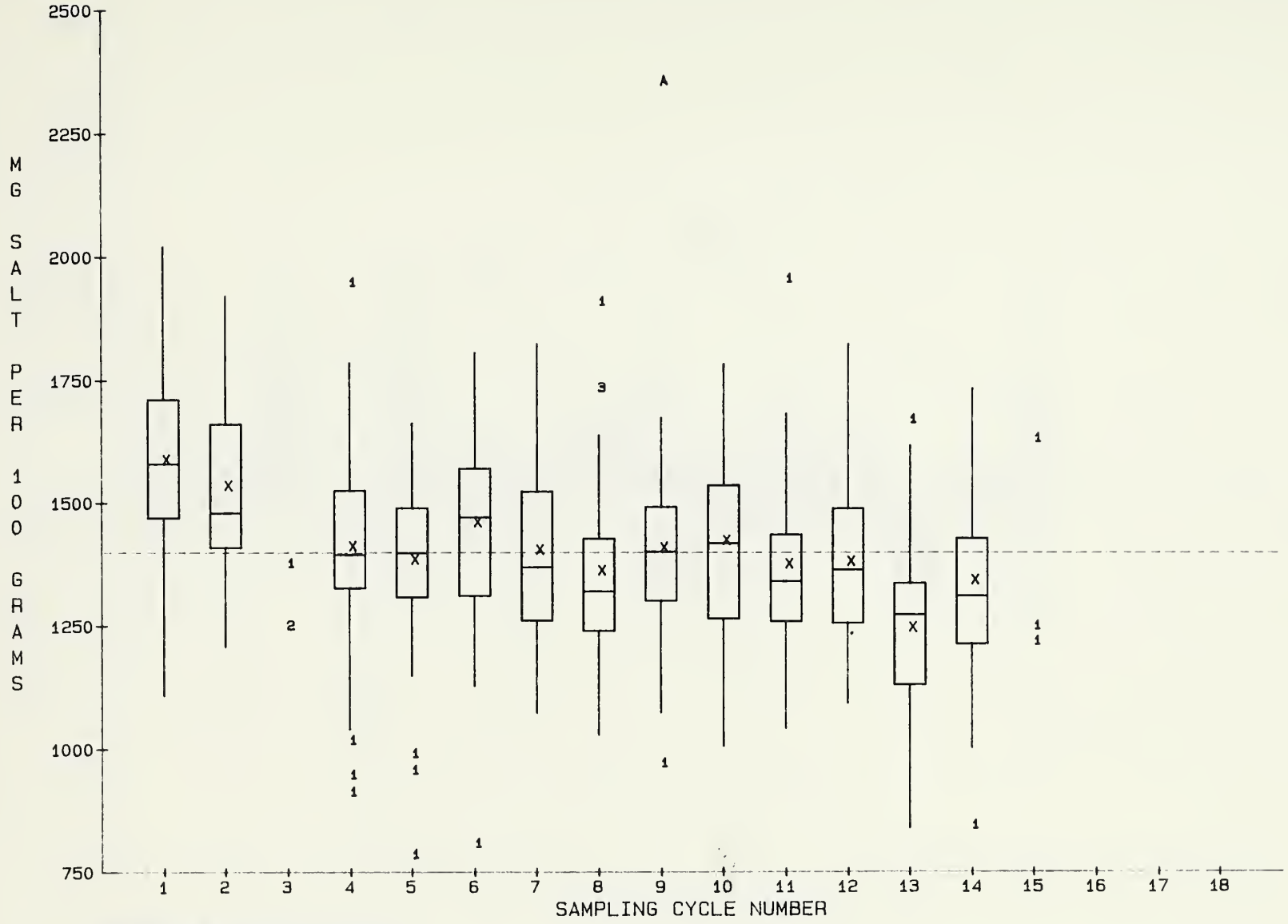
Figure 25. Boxplots of Salt vs Sampling Cycle - BOLOGNA Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

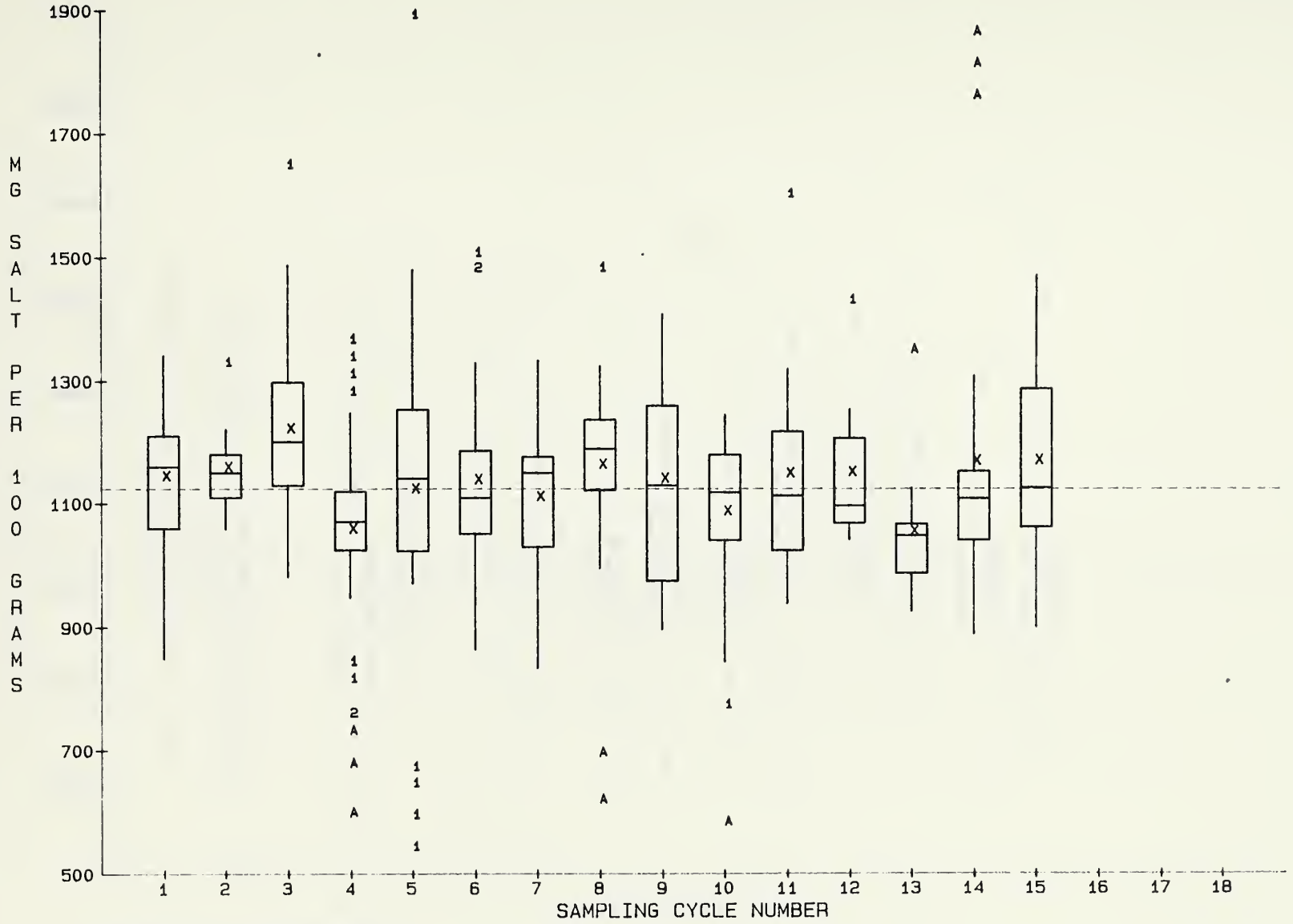
Figure 26. Boxplots of Salt vs Sampling Cycle - PIZZA Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

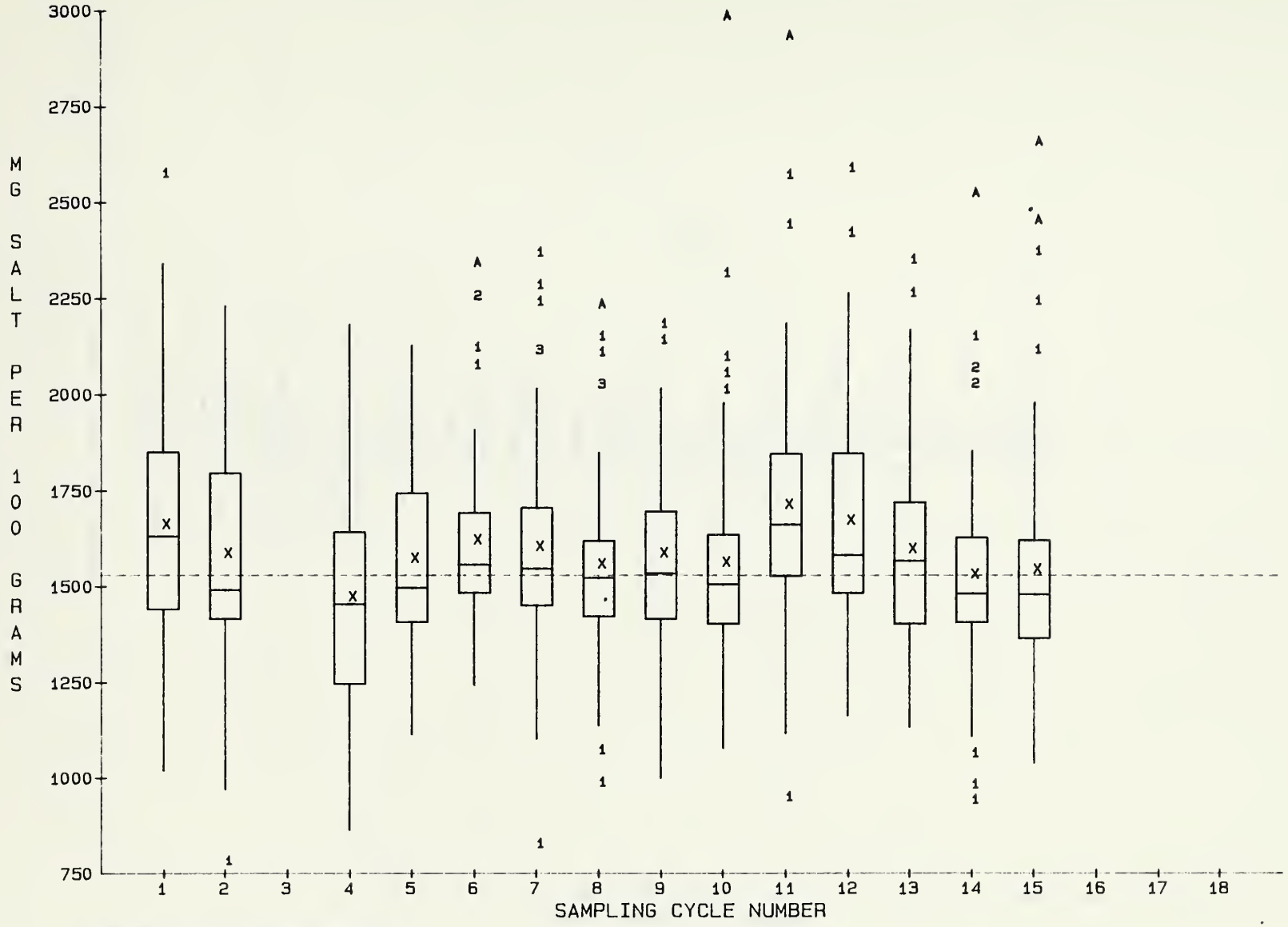
Figure 27. Boxplots of Salt vs Sampling Cycle - SPAGHETTI Product Class



Dashed Line - Overall Madian.
Solid Lina Within Box - Madian.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

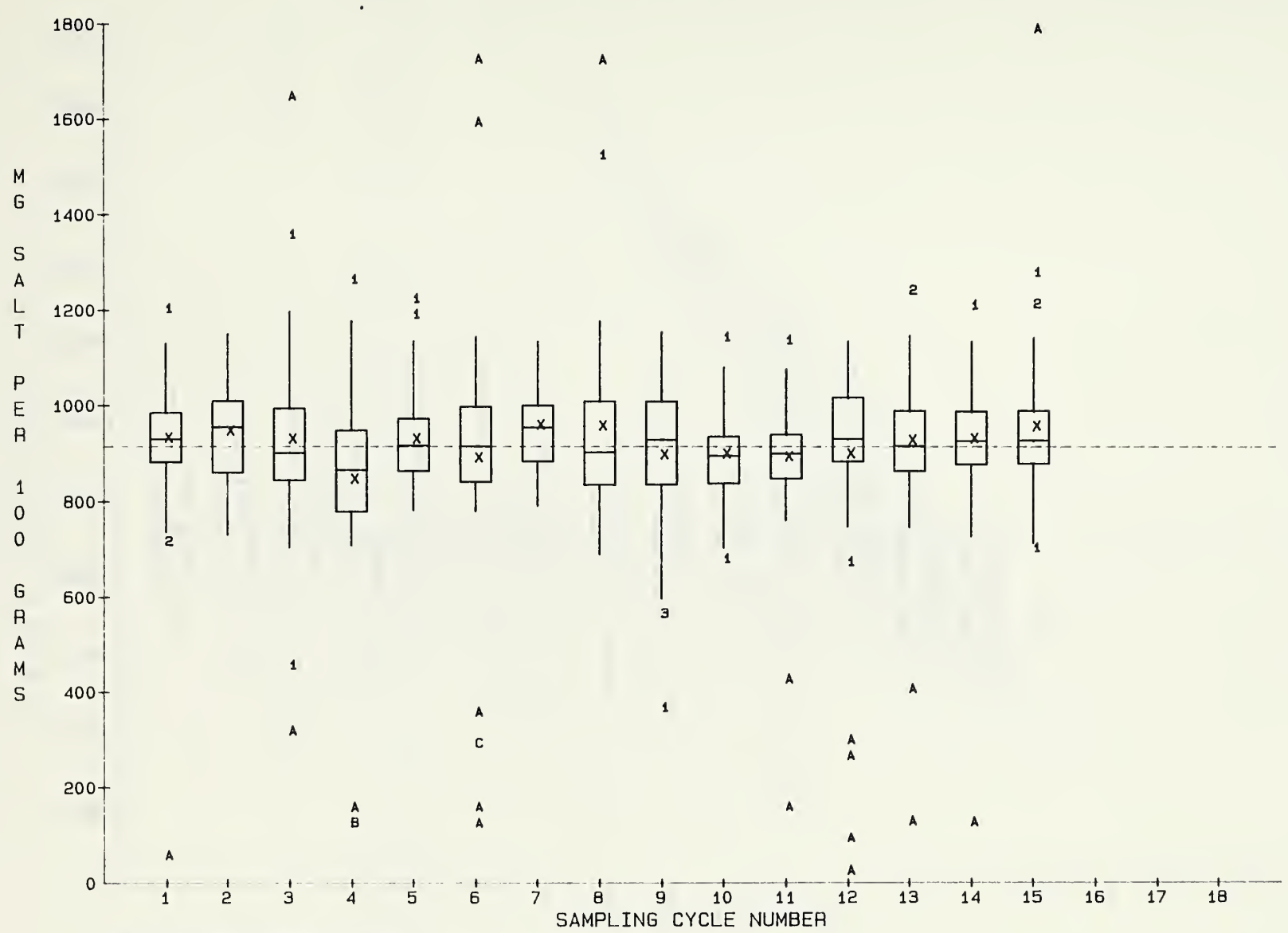
Figure 28. Boxplots of Salt vs Sampling Cycle - SAUSAGE Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

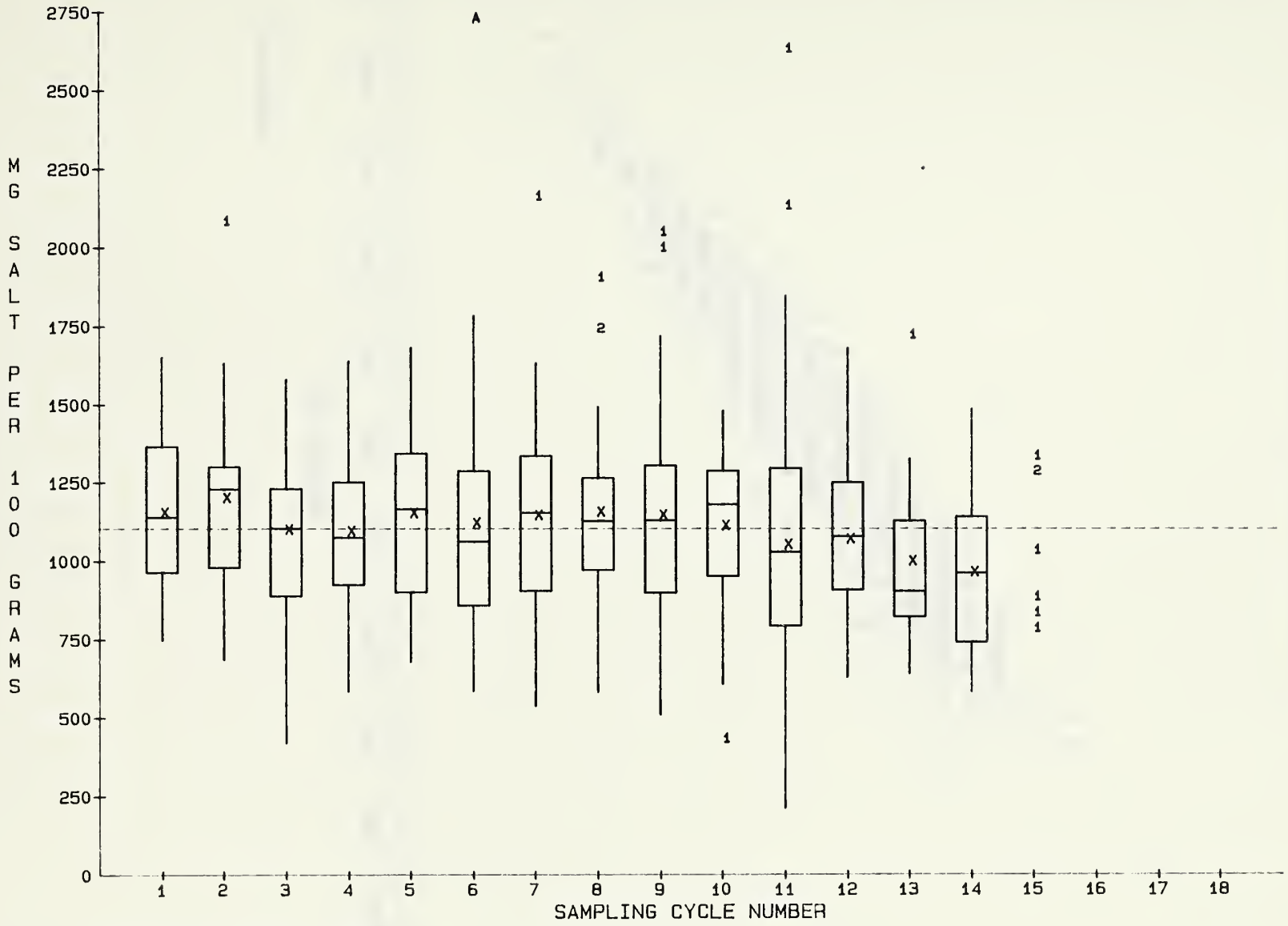
Figure 29. Boxplots of Salt vs Sampling Cycle - SOUP Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

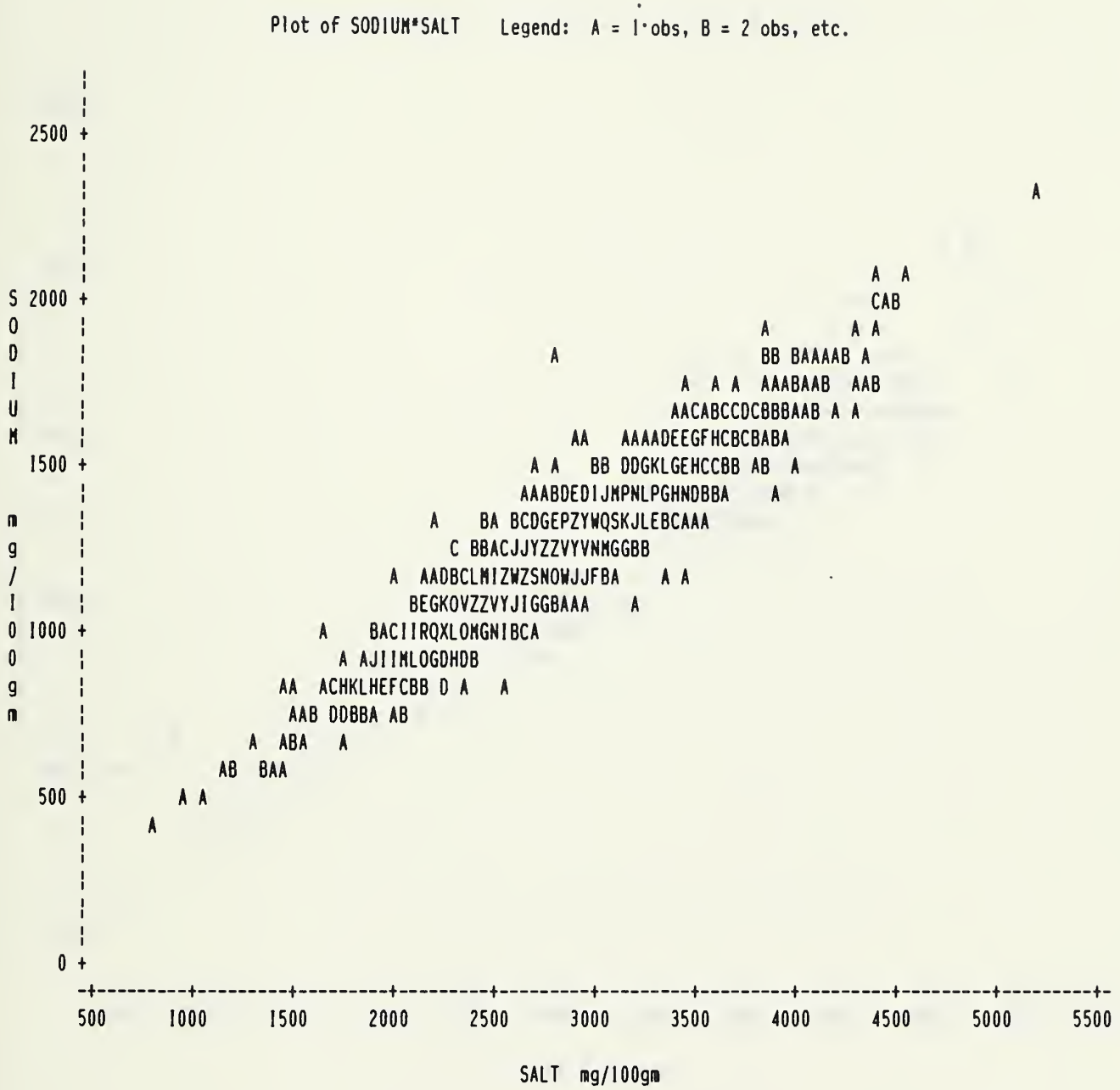
Figure 30. Boxplots of Salt vs Sampling Cycle - PIES Product Class



Dashed Line - Overall Median.
Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

Figure 31. SODIUM versus SALT for HAM Product Class for Sampling Cycles 1 - 15.



NOTE: 19 obs hidden

Figure 32. SODIUM versus SALT for CANNED LUNCHEON MEAT Product Class for Sampling Cycles 1 - 15.

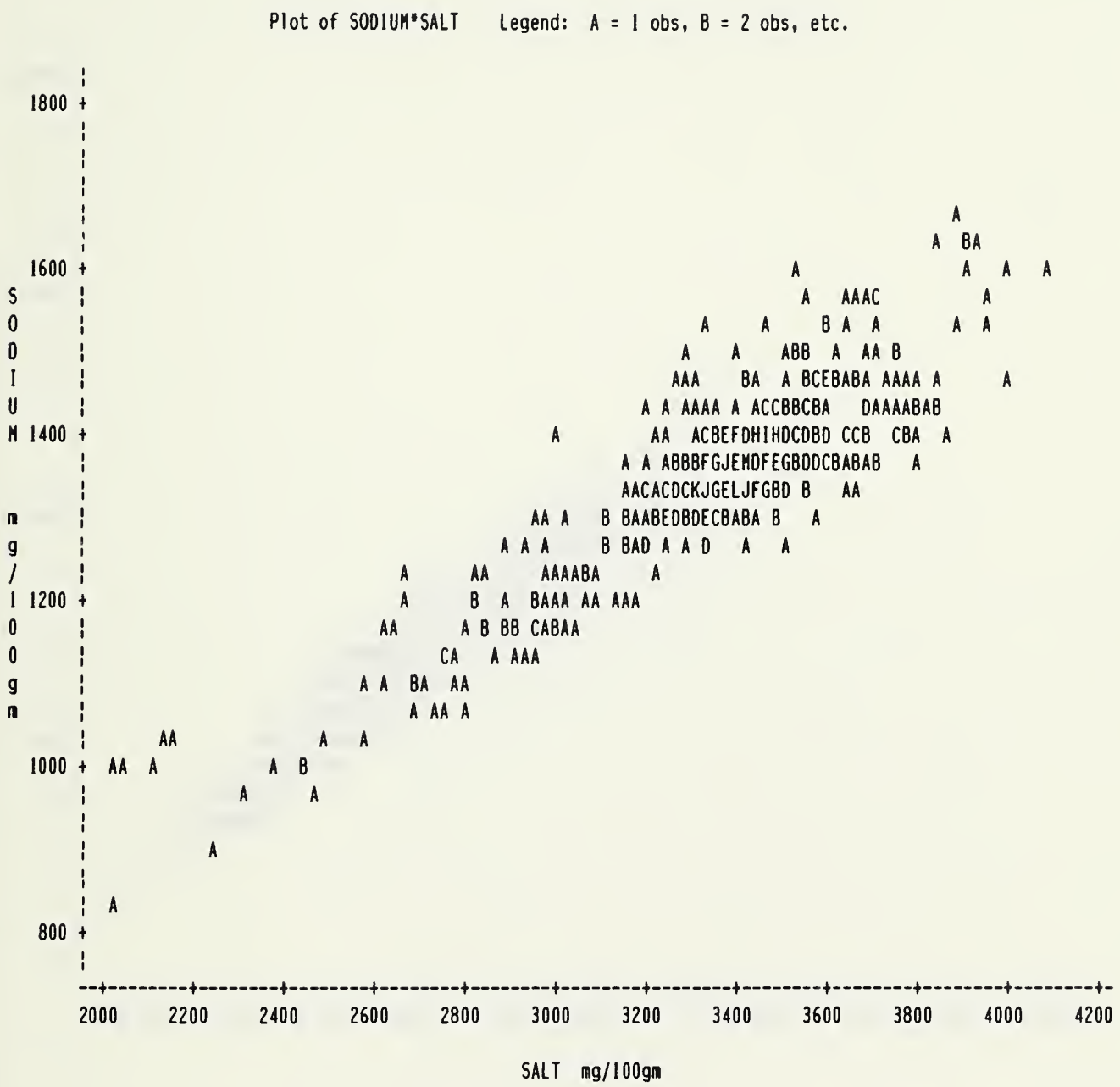
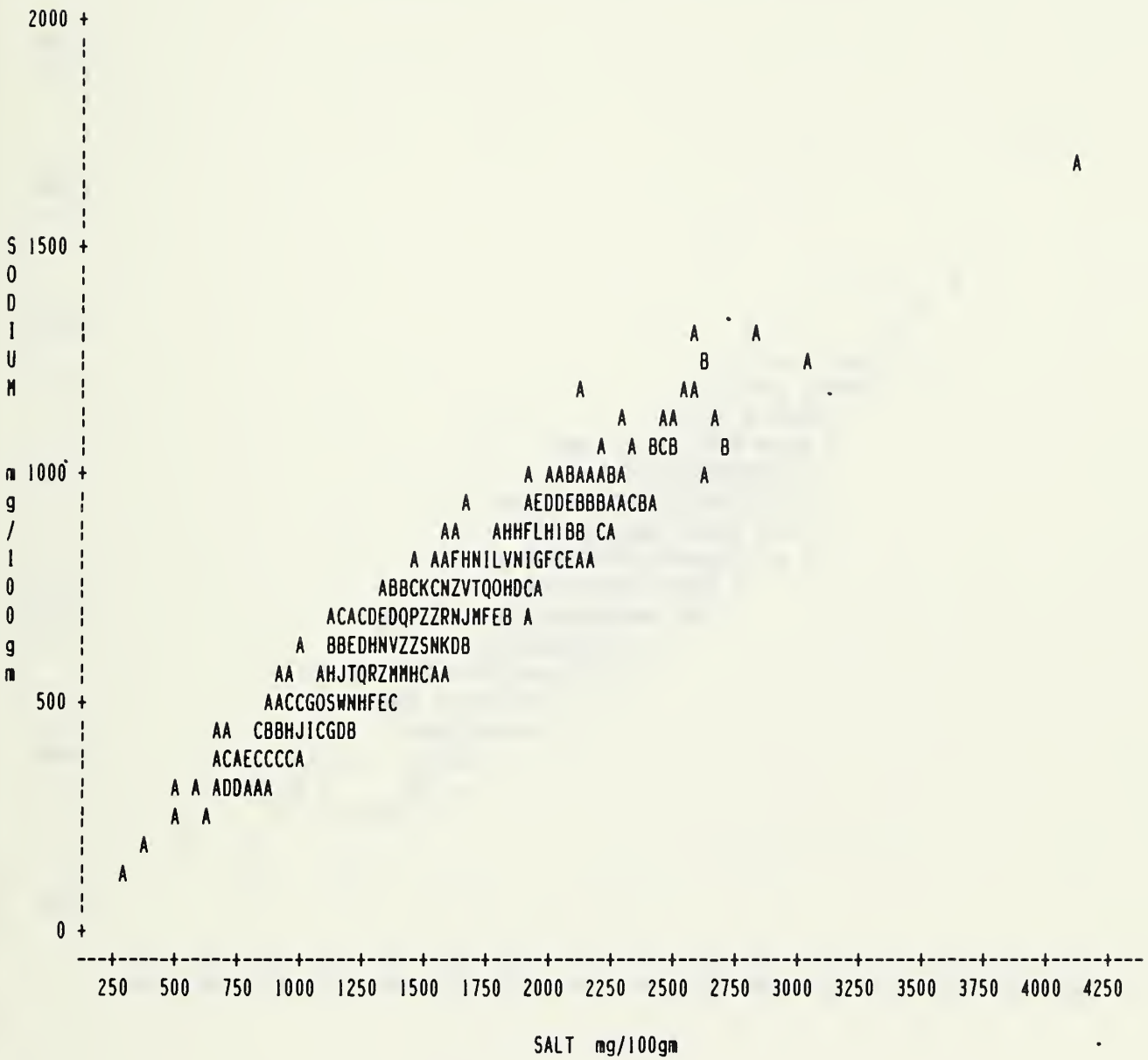


Figure 33. SODIUM versus SALT for BACON Product Class for Sampling Cycles 1 - 15.



NOTE: 24 obs hidden

Figure 34. SODIUM versus SALT for BOLOGNA Product Class for Sampling Cycles 1 - 15.

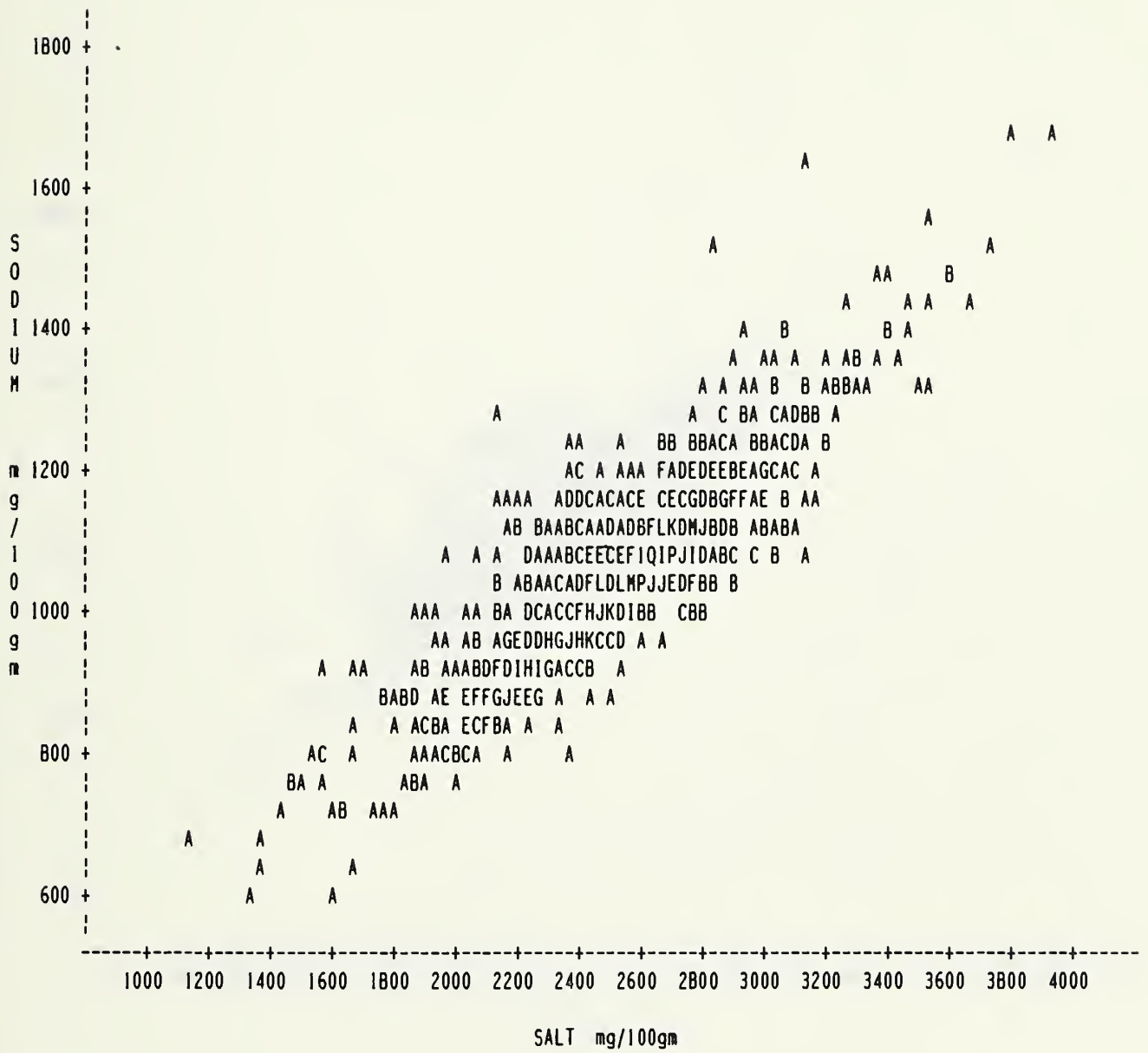


Figure 35. SODIUM versus SALT for PIZZA Product Class for Sampling Cycles 1 - 15.

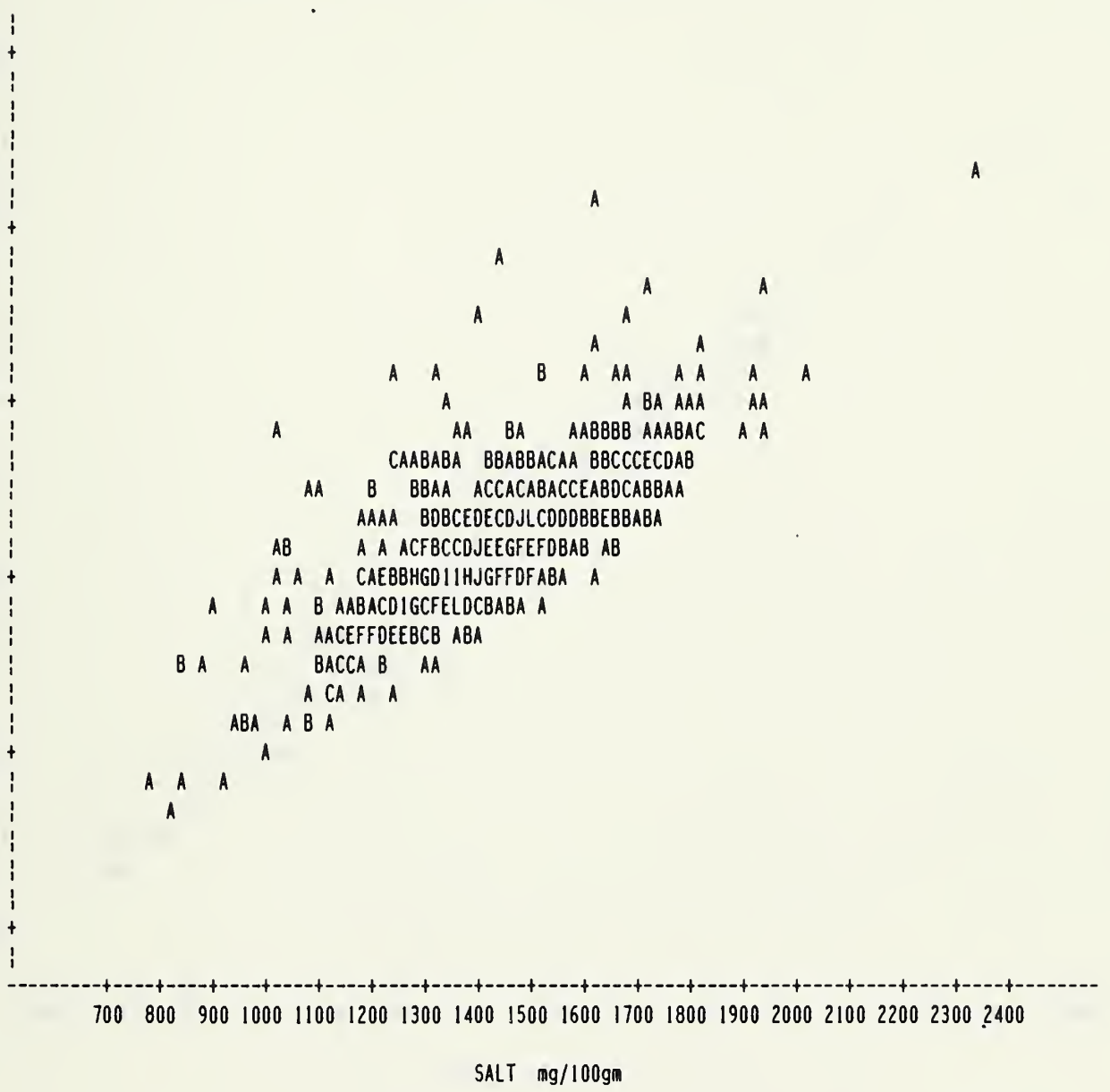


Figure 36. SODIUM versus SALT for SPAGHETTI Product Class for Sampling Cycles 1 - 15.

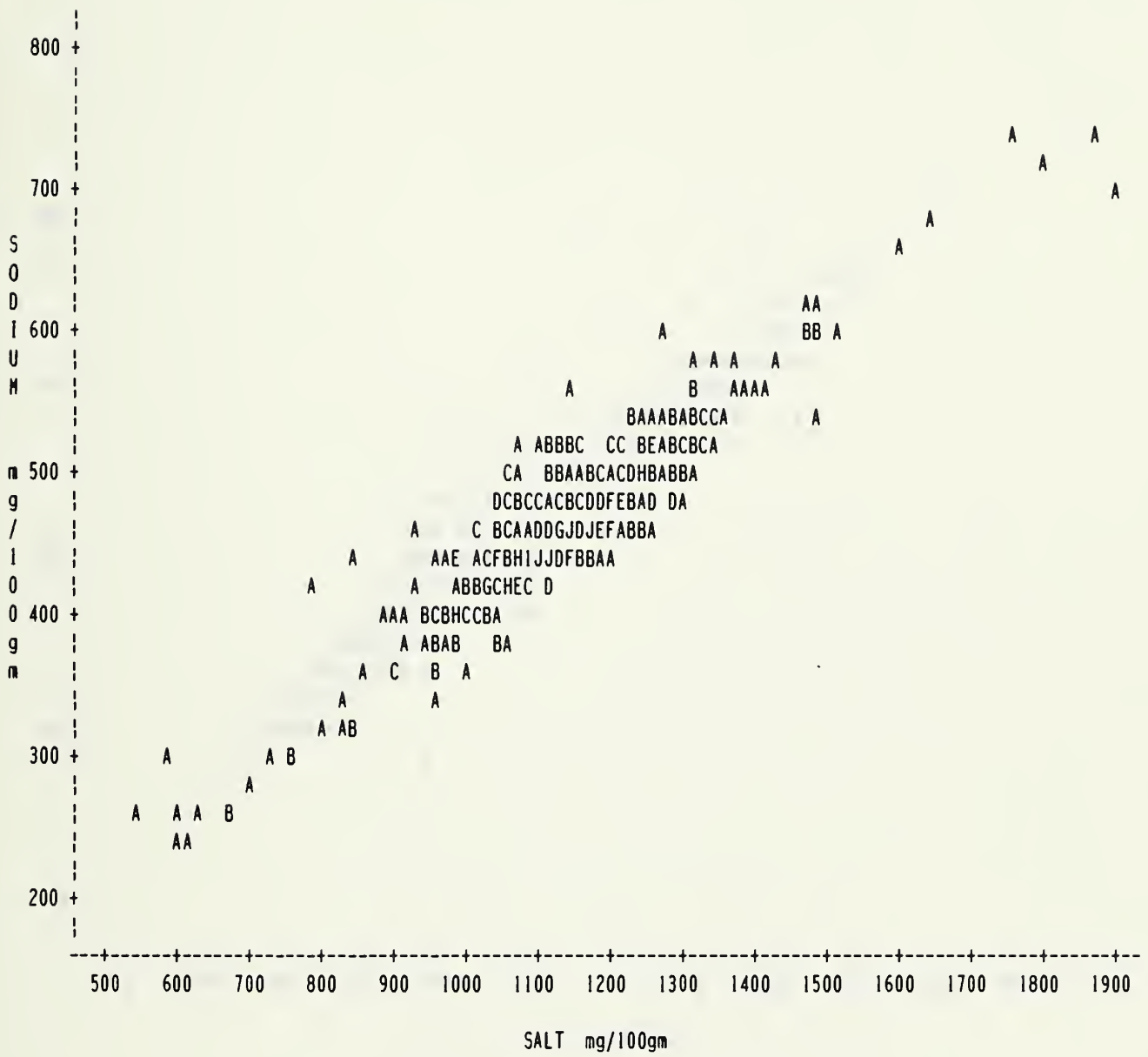
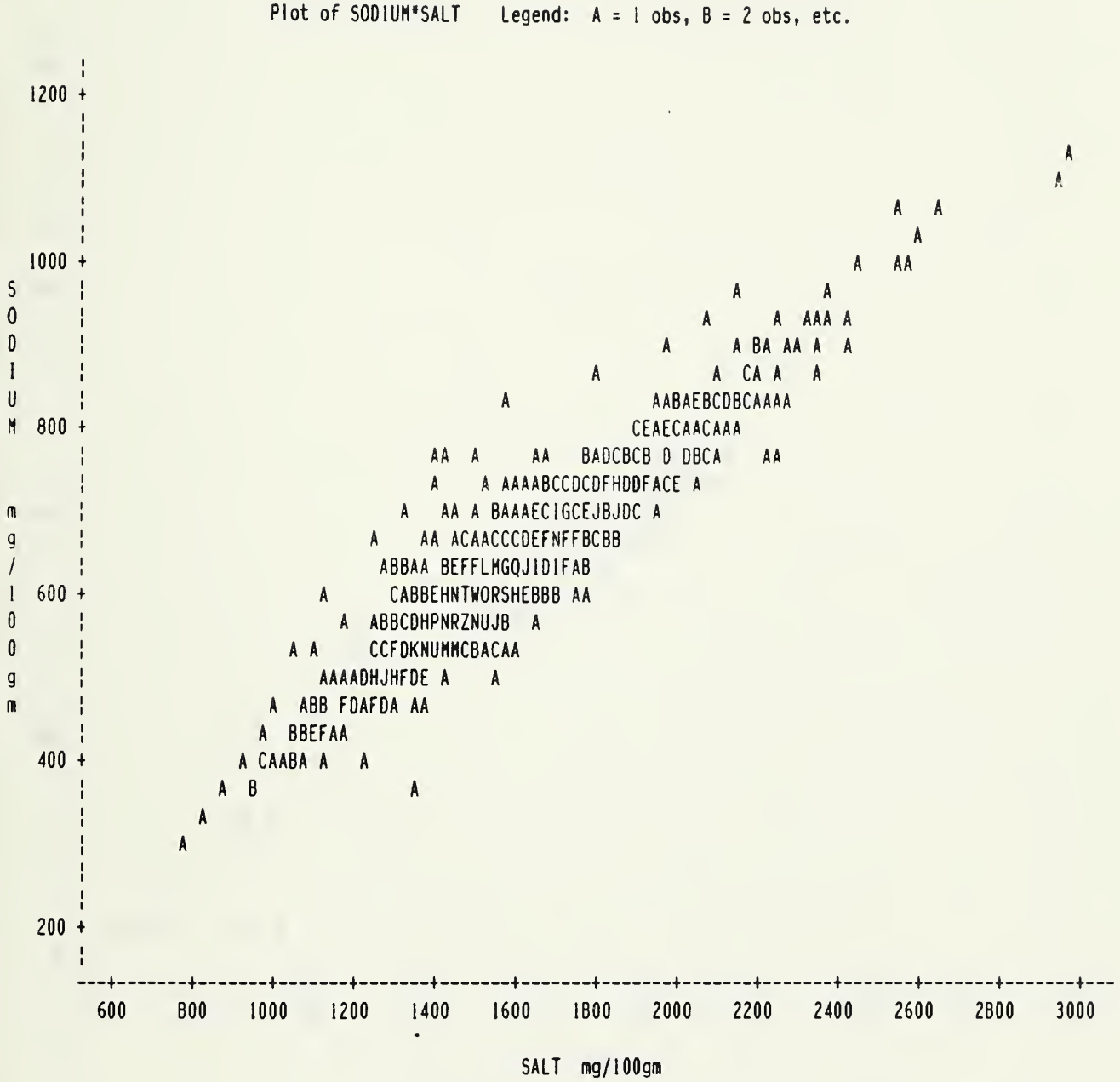
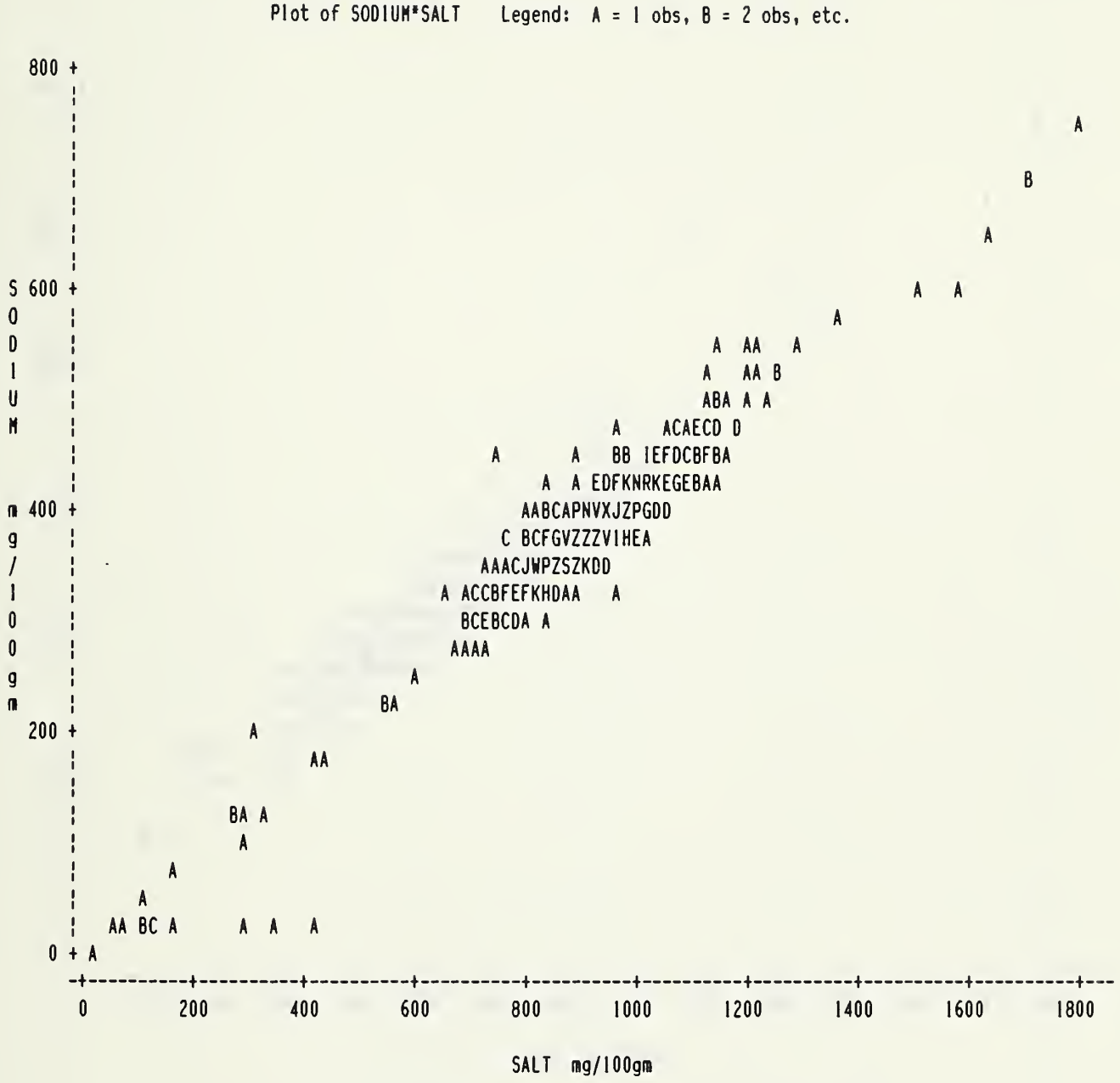


Figure 37. SODIUM versus SALT for SAUSAGE Product Class for Sampling Cycles 1 - 15.



NOTE: 2 obs hidden

Figure 38. SODIUM versus SALT for SOUP Product Class for Sampling Cycles 1 - 15.



NOTE: 45 obs hidden

Figure 39. SODIUM versus SALT for PIES Product Class for Sampling Cycles 1 - 15.

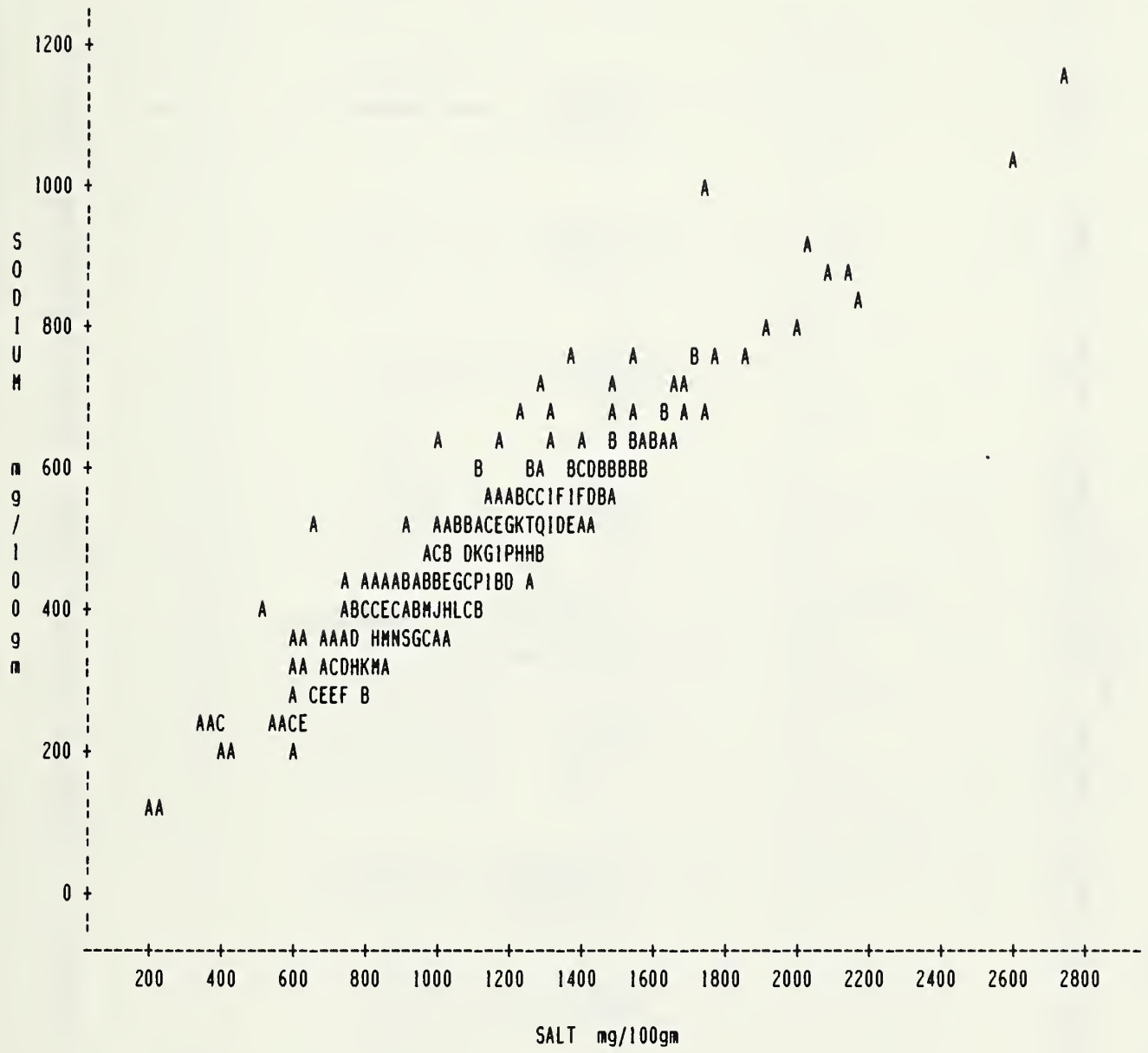
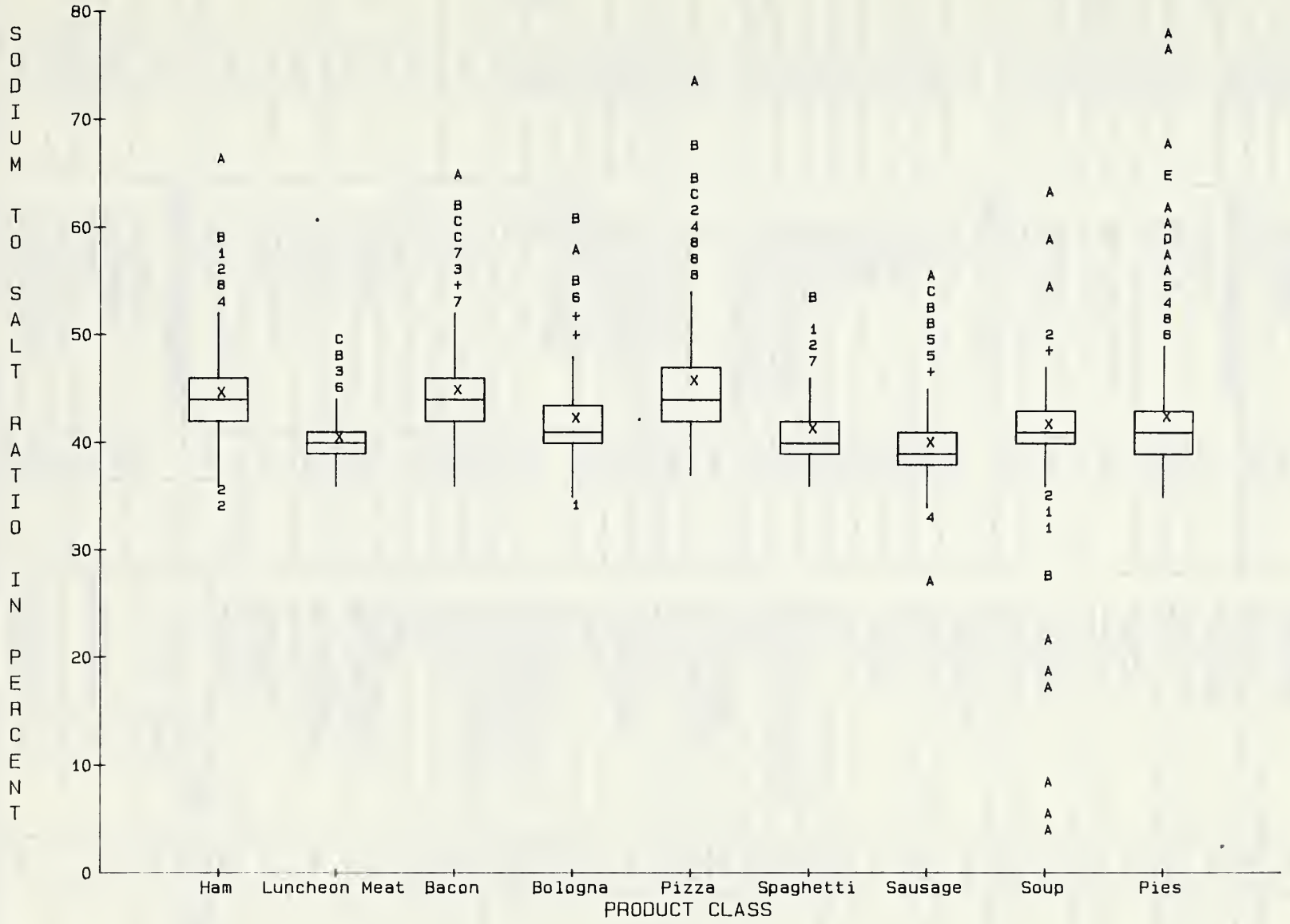


Figure 40. Boxplots of Sodium to Salt Ratio vs Product Class - Combined Data Sampling Cycles 1 - 15.



Solid Line Within Box - Median.
Symbol X - Average.

Further explanation of the boxplots is given in Appendix B.

APPENDIX A - MP FORM 404

THIS REPORT IS REQUIRED BY LAW (9 CFR 320.6). FAILURE TO REPORT CAN RESULT IN SUSPENSION OR WITHDRAWAL OF FEDERAL INSPECTION

S. DEPARTMENT OF AGRICULTURE OOD SAFETY AND QUALITY SERVICE T AND POULTRY INSPECTION PROGRAM **PROCESSING OPERATIONS** **T OFFICIAL ESTABLISHMENTS**	QUARTER ENDING (Month, Day, & Year)	NO. DAYS OF OPERATION	FORM APPROVED OMB NO. 40-R2039
	TO: INSPECTOR IN CHARGE	REGION/STATE/CIRCUIT CODE	EST. NO.

NO MEAT FOOD PRODUCTS PROCESSED AND/OR CANNED This report is required under 9 CFR 320.6

	CODE NO.	POUNDS
Briskets	1012	
Other	1019	
	1020	
Meats	1030	
OR DRIED OR COOKED		
-Bone-In	1121	
-Bone-In, Water added	1122	
-Semi Boneless	1123	
-Semi Boneless, Water added	1124	
-Boneless	1125	
-Boneless, Water added	1126	
-Sectioned & Formed	1127	
-Sectioned & Formed, r added	1128	
-Dry Cured	1129	
-Regular	1140	
-Water added	1141	
	1110	
cooked	1150	
Dried	1151	
Smoked, Dried or Cooked	1160	
Beef	1310	
Pork	1311	
Other	1312	
ked Cured Sausage	1320	
	1321	
-Dried	1322	
s/Wieners, Regular, Retail	1330	
s/Wieners, Regular, Bulk	1331	
/Wieners, with rders, Retail	1332	
s/Wieners, with rders, Bulk	1333	
s/Wieners, with ty meats, Retail	1334	
s/Wieners, with ty meats, Bulk	1336	
s/Wieners, with rders and variety ts, Retail	1338	
s/Wieners, with rders and variety ts, Bulk	1337	
na-Regular	1340	
na-with extenders	1341	
na-with variety meats	1342	
na-with variety s and extenders	1343	

SAUSAGE (Cont.)	CODE NO.	POUNDS
Liver Sausage and Braunschweiger	1350	
Other	1360	
SLICED/PACKAGED PRODUCT		
Bacon-Retail	1440	
Bacon-Bulk	1441	
Ham	1430	
Sausage, Loaves, Luncheon Meat, under 12 oz.	1421	
Sausage, Loaves, Luncheon Meat, 12 oz. or over	1422	
Other	1450	
FRESH/FROZEN PRODUCT		
Beef Cuts	1210	
Pork Cuts	1215	
Other Cuts	1220	
Beef Boning	1225	
Pork Boning	1226	
Other Boning	1227	
Mechanically Processed-Beef	1251	
Mechanically Processed-Pork	1252	
Mechanically Processed-(Other)	1253	
Steaks, Chops, Roasts	1230	
Steaks, Chops, (Chopped/formed)	1231	
Hamburger/Ground Beef	1235	
Other-Fresh/Frozen	1240	
CONVENIENCE FOODS (Frozen and/or Unfrozen)		
Pizza	1610	
Pies	1615	
Dinners	1620	
Entrees	1625	
Other	1630	
FATS AND OILS		
Lard Rendered	1510	
Lard Refined	1520	
Edible Tallow	1540	
Compound Containing Animal Fat	1570	
Oleomargarine Containing Animal Fat	1580	
MISCELLANEOUS MEAT PROD.		
Cured Meat Loaves	1712	
Nonspecific Loaves	1713	
Meat Patties	1715	
Other formulated Prod.	1718	
Horse & Equine Products	6910	
Animal Foods	6960	

CANNED PRODUCTS	CODE NO.	POUNDS
Luncheon Meat 50 oz. or over	2811	
under 50 oz.	2812	
Chili Con Carne 50 oz. or over	2841	
under 50 oz.	2842	
Meat Stew 50 oz. or over	2731	
under 50 oz.	2732	
Hash Products 50 oz. or over	2831	
under 50 oz.	2832	
Pasta Meat Product 50 oz. or over	2741	
under 50 oz.	2742	
Canned Hams under 3 lbs.	2821	
3-6 lbs.	2822	
over 6 lbs.	2823	
Pork Shoulder Picnics and Loins	2840	
Viennas	2850	
Franks and Wieners	2860	
Misc. Sausage Products	2770	
Deviled Ham	2870	
Potted Meat Food Products and Spreads	2880	
Tamales	2890	
Sliced Dried Beef	2710	
Chopped Beef Hamburgers	2720	
Vinegar Pickled Products	2750	
By-Product, Other than Pickled	2760	
Corned Beef	2780	
Soups	2790	
ALL OTHER		
With 20% or more meat and/or Meat by-products	2851	
Less than 20% meat and/or Meat by-products	2852	
Horse and Equine Meat (all types)	6940	
Animal Foods	6990	

	CODE NO.	UNITS	CODE NO.	POUNDS
TOTAL GLASS CONTAINERS	9010		9011	
TOTAL SEMI-RIGID CONTAINERS	9020		9021	
TOTAL FLEXIBLE RETORTABLE CONTAINERS	9030		9031	

F FIRM	BY	TITLE	APPROVED BY INSPECTOR

404 (12/80) REPLACES MP FORM 404 (6/79) WHICH MAY BE USED

DPC CHICAGO, ILL.

APPENDIX B

Description of Box-and-Whisker Plots

Box-and-whisker plots (referred to as "boxplots") provide a quick, visual summary of data. These plots constitute an important advancement in graphical data presentation techniques. They present the data's location, spread or variability, skewness or asymmetry, and extreme or outlying values. They also enable an observer to quickly compare two or more sets of data by examining the boxplots side-by-side.

To construct a boxplot (see Appendix Figure B-1), a box is drawn from the lower quartile (25th percentile or first quartile) of the data values to the upper quartile (75th percentile or third quartile). The width of the box is arbitrary. A line is drawn in the box at the median (50th percentile). Thus, the box gives the location, spread, and skewness of the middle 50 percent of the data, i.e., the most "typical" or "well-behaved" values.

Central location of the data is given by the median and, more generally, by the location of the box relative to the vertical axis. Another measure of central location is the mean value. The mean is indicated by the letter X, which would usually be located within the box. However, since the mean value is relatively sensitive to extreme values as compared with the median, large differences between the median and mean would typically indicate either an asymmetric (skewed) distribution, or, several extreme values that were not symmetrically located above and below the median. Both situations could occur simultaneously.

Spread (variability) of the middle 50 percent of the data is represented by the length (height) of the box which is the interquartile range (upper quartile minus the lower quartile). The box will be long if the interquartile range (i.e. the range of the middle 50 percent of the data) is close in magnitude to the overall range of the data. This situation would typically indicate that the data is highly variable. The box will be short if the data have little variability. Skewness (asymmetry) for the middle 50 percent of the data is indicated by the displacement of the median from the center of the box.

The top and bottom fourths of the data are indicated by vertical lines, or "whiskers". Ideally, the top fourth of the data is represented by drawing a whisker from the upper quartile to the largest data value (and similarly from the lower quartile to the smallest data value). However, if a data set has some very large

(or small) values, the whisker(s) would be "stretched out" and give a distorted impression. To prevent this distortion, the whisker is drawn only to the "largest (or smallest), reasonably behaved or typical value" and the atypical values are plotted separately.

The following, somewhat arbitrary, rule is employed for determining the length of the upper whisker (with obvious modifications for the lower whisker). The interquartile range is multiplied by 1.5. This product is added to the upper quartile. The result is called the upper "inner fence". This product is again added to the upper inner fence to obtain the upper "outer fence". The upper whisker is then drawn from the upper quartile (top of the box) to the largest data value (called the upper "adjacent value") which does not exceed the upper inner fence.

Any values between the inner and outer fences are called "possible outliers" and are plotted using a numeric count ("1" for one data value, "2" for two data values, ..., with a "+" for 10 or more overlapping data values). Any values outside (exceeding) the outer fence are called "probable outliers" and are plotted using a letter count "A" for one data value, "B" for two data values, etc.).

It is emphasized that the designation of possible or probable outliers is relative to the behavior of the bulk of the observed data and the rule used to define the inner and outer fences. For example, these outlying values are not necessarily erroneous values but could simply represent unusual products relative to the majority of the products within a product class or sampling cycle.

The whiskers also provide information on the spread and skewness of the data. Long whiskers (relative to the length of the box) indicate larger variability, while short whiskers indicate less variability. Upper and lower whiskers of approximately equal length indicate symmetry of the data values, while unequal whisker lengths indicate asymmetry (skewness).

Another somewhat arbitrary rule is to not construct a boxplot for any set of data having fewer than 10 values. In these situations, no box is plotted and only numeric counts of the data values are plotted ("1" for one data value, "2" for two data values, etc.). These values should not be confused with the numeric count used to designate possible outliers which were described previously. (The only instances where this situation occurred in this report was for several of the salt versus sampling cycle boxplots.)

In addition to their use as a graphical presentation technique, boxplots can serve as a useful data screening tool to identify incorrect data values (e.g., errors made in sample collection, laboratory analysis, or data entry) as well as to identify unusual products. While boxplots can provide a consistent and objective data screening procedure for identifying extreme data values, it should be noted that errors that do not produce extreme values would not usually be detected using this approach.

As an example of how a boxplot would qualitatively appear for sample data obtained from a normal distribution (i.e., a bell-shaped, symmetric distribution), the median and mean values would be almost identical (indicating symmetry), and the median would be almost equally spaced between the upper and lower quartiles (also indicating symmetry). The whiskers would be of almost equal length (again indicating symmetry). There would be very few possible outliers (approximately 0.7% of the number of data values). There would be almost no probable outliers (less than 0.01% of the number of data values). The outliers would be approximately equally distributed between high and low values.

An interpretation of the example boxplot given in Figure B-1 could be: The data are asymmetrically distributed and show positive skewness. This can be noted by observing that the median is closer to the lower quartile than the upper quartile, and that the mean is greater than the median. The difference between the mean and median could be due to either the positive skewness or caused by the greater number of high-valued outliers than low-valued outliers, or both reasons. The asymmetry and positive skewness is further indicated by the unequal length of the whiskers and greater number of high-valued outliers than low-valued outliers.

For further information on box-and-whisker plots refer to Tukey (1977).

Figure B-1. Example of a Box-and-Whisker Plot